OCT 24 1921

VOL. LXXXIX. No. 2289. [All Rights Reserved.] OCTOBER 7, 1921. [Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage.] PRICE SIXPENCE.

LONDON: PUBLISHING OFFICE, 4, LUDGATE HILL, E.C. 4. SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d.; Colonial and Foreign, £2 1s. 6d. per annum.—NEW YORK: D. VAN NOSTRAND CO., 25, Park Place, New York City. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. PARIS: BOIVEAU & CHEVILLET, Librairie, Etrangère, 22, Rue de la Banque.
Telegraphic Address: "Ageekay, Cent., London." A B C Code. Telephone Nos.: Central 8260 and 8261.

LITHOLITE INSULATORS, Ltd.
56—57, Hackney Grove, London, E. 8.
'Phone and Telegrams: Dalston, 692, London.
FIREPROOF AND OTHER GRADES.
ESTABLISHED 20 YEARS.

Birkby's **"ELO"**
For all purposes for which moulded insulation is required specify "ELO"—which is water, oil and heatproof.
FLEMING, BIRKBY & GOODALL, LTD., LIVERSEDGE, YORKSHIRE.

WRIGHT 'Phone: 499. Tel.: Motor.
A.C. and D.C. **MOTORS.**
WRIGHT MOTORS, Ltd., HALIFAX.

EVERY DESCRIPTION OF
SMALL TURNED PARTS and CASTINGS for ELECTRICAL ENGINEERS.
A. MORTON,
6, Tenby Street North, Birmingham.

BROOK
ONE, TWO and THREE-PHASE
MOTORS.
See Sup 39.

SWITCHGEAR.
ERNEST F. MOY, LTD.,
Manufacturing Electrical Engineers and Government Contractors.
GREENLAND PLACE, CAMDEN TOWN, LONDON.

MICA & MICANITE
TAYLOR & PETTERS, LTD.,
40, Hatton Garden, London, E.C. 1.
'Phone: 4575 Central.
See page ii.

MOTORS. • DYNAMOS.
VICTORIA DYNAMO & MOTOR CO.,
CRAVEN HOUSE,
Kingsway, London, W.C. 2.
'Phone: Gerrard 1945.

CHURTON
SINGLE and POLYPHASE
MOTORS.
T. HARDING CHURTON & CO., LTD.,
Atlas Works, Water Lane, LEEDS.

ELECTRIC MOTOR REPAIRS.
ARMATURES REWOUND.
H. DUNN & SON,
Newington Causeway,
Tel.: Hop. 1167. LONDON, S.E. 1

"EMPIRE"
AUTOMATIC CONTROL
FOR
Pumps, Compressors, Machine Tools.
ELECTRIC CONTROL, LIMITED, GLASGOW.

WESTERN-ELECTRIC
COMPANY, LIMITED
Norfolk House, Victoria Embankment, W.C.
Works: NORTH WOOLWICH, LONDON, E.
TELEPHONES & CABLES.
See Advertisement last week, p. xviii.

CONNOLLY'S (BLACKLEY), Ltd.
for
WIRES AND CABLES.
See Advertisement this week, p. iii.

WHITE
Electrical Instrument Co., Ltd.
2, 4 & 6, GLOUCESTER ST.,
CLERKENWELL, LONDON, E.C. 1.
Wire: Voltograph, London. 'Phone: Clty. 8680

ELECTRIC MOTORS.
One, Two and Three-Phase.
BRITTAIN'S ELECTRIC MOTOR Co.
(Late Langdon-Davies Electric Motor Co.),
110, Cannon Street, London, E.C. 4.

INSULATING
- - BEADS - -
Immediate Delivery.
HOLDER-HARRIDEN LTD., 35/37, Noble St., London, E.C.

A Remedy for Unemployment.
See Sup. 12.

For Air Pumps, Condensers, Circulating Pumps.
VALVES.
DERMATINE
DERMATINE CO., Ltd.,
Neate St., London, S.E.5

SHUNT REGULATORS.
MOTOR STARTERS and all classes of Resistances Work.
STAR DELTA SWITCHES.
THE SOLENOID REGULATOR CO.,
HIGHGATE SQUARE, CAMP HILL,
Telephone: Midland 582 **BIRMINGHAM,** Telegrams: Solenoid, Birmingham.

MAVOR & COULSON, Ltd.,
GLASGOW.
MOTORS, DYNAMOS, SWITCHGEAR.

ONE POUND = TWO POUNDS.
See Sup. 5
British Aluminium Co., Ltd., 109, Queen Victoria St., London.

RAYNER & HEALD, LTD.,
DUKE STREET, DERBY.
TWO & THREE-PHASE MOTORS only.

FULLER'S UNITED ELECTRIC WORKS, LIMITED.
MANUFACTURERS OF
ACCUMULATORS BATTERIES
WIRES & CABLES CARBONS, &c.
WORKS: CHADWELL HEATH, ESSEX.
General Sales Offices:
IDDESLEIGH HOUSE, Caxton St., Westminster.
Grams: Blocbat, Vic. London. *'Phone: Victoria 6363.*

INGLEBY & CO.,
Old Lane, Beeston, LTD.
MOTORS *LEEDS.*
FOR DIRECT AND ALTERNATING CURRENT
Tel. 20275
Delivery from Stock up to 50 H.P.

Advertisement Index, see page xliv.

SWITCH ON EDISWAN

For any of the following Electrical Supplies :—

Accessories.
Accumulators.
Bells & Accessories.
Circuit Breakers.
Controllers.
Decorative Fixtures.
Decorative Glass Ware.
Dry Cells.
Dynamos.
Electric Fires and Radiators.
Fans and Ventilators.
Heating and Cooking Appliances.
Industrial Fittings.
Inert Cells.
Instruments—Indicators.
Instruments—Meters.
Ironclad Switch Gear.
Lamps—Royal Ediswan gas-filled & vacuum types.
Leclanche Cells.
"Little Glutton" Vacuum Cleaner.
Motors.
Oil Switches,
Telephones & Accessories.
Wires and Cables.

Mark the items in which you are interested and post this page to us, when we will gladly supply full information.

THE EDISON SWAN ELECTRIC CO., LTD.,
PONDERS END, MIDDLESEX.
London Showrooms :
123-5, Queen Victoria St., E.C. 4 & 71, Victoria St., S.W.1

GLASS

Accumulator Boxes & Glass Taps of every description

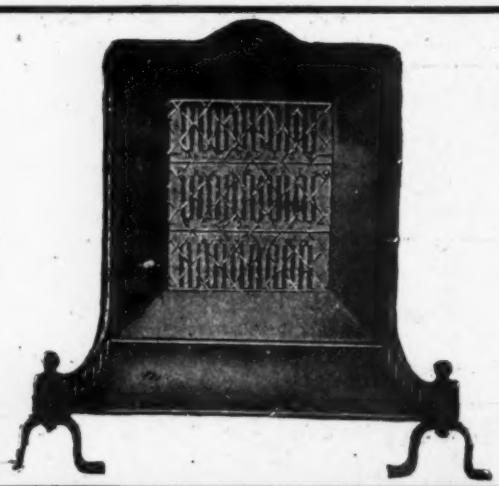
& all other kinds of Glassware

Jules Lang & Son,
Charlton Works,
Charlton Place,
Islington, N.1.
'Phone: 2770. North. (3 Lines)
Telegs: "Assorted, Phone, London."
Codes: A.B.C., 5th Ed.
Scott's: 10th Ed. (1906)
Bentley's Complete Phrase Code

MICA & MICANITE

INSULATORS FOR EVERY DESCRIPTION OF ELECTRICAL WORK.
Contractors for Air Board, War Office and Admiralty Requirements.
CUTTING AND GAUGING OUR SPECIALITY.
BEST QUALITY MICA ONLY.

'PHONE—4575 CENTRAL.
TELEGRAMS—"MICAYLOR, LONDON."
TAYLOR & PETTERS, LTD.,
40, HATTON GARDEN,
LONDON, E.C. 1.
(The Oldest Established Mica House in the country.)
AND ALL BRITISH.



THE
ARORA ELECTRIC FIRE

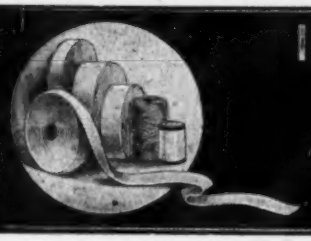
Has given universal satisfaction.

WHY? Because OUR patented Element is of HEAVY SECTION and has LOW Current Density, yet it glows at a HIGH TEMPERATURE.

Low Price, Robust, Cheery, Economical.

Write for List E (Fires & Cookers) to Sole Manufacturers :

THE ARORA CO., Loughborough.
(Proprietors : MESSENGER & Co., LTD.)



INSULATING MATERIALS - *Delivery from Stock*
SUPERFINE COTTON, LINEN & SILK TAPES,
DYNAMO TAPES, FIELD COIL WEBBING, CABLE TAPES,
ADHESIVE TAPE, TUBULAR SLEEVING, ARMATURE BINDING CORDS &c
JOHN MACLENNAN & Co
115 NEWGATE STREET LONDON E.C.1
Telephone - City 3115
And at GLASGOW

Vo

M
G
C
D
T
E
E
T
E
I
T

C

T
A
N
B
N
C
S
M
T

N

L
N
P
C

U
C
C

A
A

I
J

N

E

THE

ELECTRICAL REVIEW.

VOL. LXXXIX. OCTOBER 7, 1921. No. 2,289.

ELECTRICAL REVIEW.

Vol. LXXXIX.] CONTENTS: October 7th, 1921. [No. 2,289.

	Page
Municipal Tramways at Bay	457
German Goods Masked as Foreign Manufactures	458
Criticism of Japanese Methods	459
Diesel-Electric Coaches	459
The Engineers' Club	459
Electric Power in Norway	459
Engineers and the Camera, by J. Walker (*illus.*)	460
"Turning" *v.* "Grinding" of Commutators, by J. T. Towlson	461
The Ideal Electric Kitchen, by Mary Gwynne Howell	462
Electroculture	463
Import Trade of China	463
The Provincial Electric Supply Committee of the United Kingdom	464
Correspondence—	
Accumulator Froth	464
A Spare Armature Incident	464
Support for French Industries	465
The E.P.E.A. and the E.T.U.	465
A Sensitive Meter (*illus.*)	465
The Glasgow Hiring Scheme	465
Re Organ Blowers	465
New Electrical Devices, Fittings and Plant (*illus.*)	466
Business Notes	467
Notes	475
City Notes	479
Stocks and Shares	479
Market Quotations	480
The Municipal Tramways Association (Inc.).—I.	481
Presidential Address	482
The Operation of Tramways and Bus Undertakings under Statutory Powers as Affected by the Roads Act, 1920	482
New Boiler-House Plant at Wimbledon Electricity Works (*illus.*)	485
Legal	487
New Patents	488
Published Specifications	488
Contractors' Column ... Advertisement page	xxx

"ELECTRICAL REVIEW" SUBSCRIPTION RATES.

UNITED KINGDOM	£1	14	8	per annum.
CANADA	1	12	6	do.
COLONIAL and FOREIGN	2	1	6	do.

Postage Free.

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 6d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE, 4, LUDGATE HILL, LONDON, E.C. 4.

Telegraphic Address: "AGEEKAY, CENT., LONDON." Code, A B C. Telephone Nos.: Central 8260 and 8261.

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

FOREIGN AGENTS:

ADELAIDE: Messrs. Atkinson & Co., Gresham Street.
AUCKLAND, N.Z.: Gordon & Gotch, Albert Street; Peter G. Tait, P.O. Box 392.
BRISBANE: Gordon & Gotch, Queen St.
CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.
DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.
JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c.: Central News Agency, Ltd.
LAUNCESTON: Gordon and Gotch, Cimitiere Street.
MELBOURNE: Peter G. Tait, 90, William Street; Gordon & Gotch, Queen Street.
MILAN: Fratelli Treves.
NEW YORK: D. Van Nostrand, 25, Park Place.
PARIS: Boyveau & Chevillet, 22, Rue de la Banque.
PERTH, W.A.: Gordon & Gotch, William Street.
ROME: Loescher & Co., Corso Umberto 1° 307.
SYDNEY: Peter G. Tait, 273, George Street; Gordon & Gotch, Pitt St.
TOKYO: Maruzen Co., Ltd., 11-16, Nihonbashi-Tori-Sanchome.
TORONTO, ONT.: Wm. Dawson and Sons, Ltd., Manning Chambers; Gordon & Gotch, 132, Bay Street.
WELLINGTON, N.Z.: Gordon & Gotch, Cuba Street.

Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "London City and Midland Bank, Newgate Street Branch."

MUNICIPAL TRAMWAYS AT BAY.

THE annual conference of the Municipal Tramways Association (Incorporated), which was held at Salford last week, was favoured with splendid weather, such as is not usually associated with that neighbourhood; some 180 delegates were present, and the arrangements for the Conference were admirably planned and carried out, so that the meeting proved thoroughly enjoyable. The leading feature of the meeting was the question of unfair competition with the tramways by road vehicles, which has long been a thorn in the side of the former, but has recently assumed dimensions and acquired an intensity far beyond all previous experience; the Conference was like a nest of hornets stirred up with a pole, and fairly buzzed with excitement and indignation. The upshot was that a strong resolution was unanimously passed, vigorously protesting against the operation of the Roads Act, 1920, and calling upon the Minister of Transport to take action in the matter.

The reason why this outburst of wrath has suddenly occurred is simply this: That on August 31st the war officially ended, and an emergency Act, which until then had provided some restraint over the competition of private concerns, no longer held sway. Consequently, a flood of motor omnibuses and charabancs was let loose, and immediately the tramways in many districts found themselves exposed to competition in its severest form.

We have often pointed out that electric tramways, subject as they are to the out-of-date provisions of the Tramway Act of 1870, which were based upon the conditions appertaining to animal haulage, are heavily handicapped by having to pave and maintain the road surface, although electric tramcars are the only class of vehicle that makes no use of the paving, whilst all others do. In many cases, too, the tramway undertaking has had to bear the cost of road widening, and other improvements for the benefit of the public and, incidentally, of its commercial rivals. Its operation is subject to onerous statutory requirements with regard to maximum fares, workmen's fares, regular running, &c., and it has to pay rates on its street works. It cannot stop running. On the other hand, its competitors are at liberty to run or not as they please, to charge what fares they think fit, to run on the paving paid for by the tramways, to ply only at the rush hours, and to leave the unremunerative periods to the tramcars; they make practically no contribution to the cost of construction or to the upkeep of the roads, and they are not subject (with certain exceptions) to examination as to their fitness for public transport traffic. Where they are in competition with the tramways they lower their fares to a cut rate—elsewhere, of course, they extort much higher rates, and if the tramways ceased to exist, there is no doubt that they would increase the fares on the routes where competition was removed. As they run regularly over the same roads they soon destroy the surface, and the community has to bear the cost of renewing it—thus, in fact, defraying part of the establishment charges of the rival concern.

Now, Parliament, in imposing conditions, and severe conditions, too, upon the tramway undertakings—municipal and other—of necessity granted them implicitly if not explicitly a monopoly of the class of public service concerned, just as it did in the cases of water, gas, and electricity supply. Yet, under the provisions of the Roads Act, 1920, any person or company is entitled to obtain a licence to ply motor vehicles for hire anywhere unless the licence is withheld for certain reasons with which we are not concerned; the only appeal

is to the Minister of Transport, whose fiat is final and cannot be reviewed by the Courts or any power save Parliament itself!—and the Ministry of Transport has up to the present shown a tendency to favour the competing road vehicles at the expense of the tramways, over which, one would imagine, it would be its plain duty to extend a protecting shield.

For confirmation of these statements we refer our readers to the report of the discussions at the Tramway Conference, given elsewhere in this issue; that the members had most substantial grounds for dissatisfaction will at once be evident. Already hard hit by the depression of the national industries (only five municipal undertakings avoided making a loss last year), they are now assailed by a fierce and irresponsible competition. We entirely sympathise with the members, whose grievance, moreover, is shared by the private undertakings, and we trust that the maximum pressure will be exerted in and out of Parliament to right their undoubted wrongs.

GERMAN GOODS MASKED AS FOREIGN MANUFACTURES.

Attention was recently directed in this journal to the fact that German firms have begun to form shareholding companies in Switzerland for various purposes, including the intention to escape the taxes placed by the Allies on German exports by sending abroad goods "naturalised" in Switzerland. The question of the passing off of German merchandise as the manufactures of other countries has also arisen in Canada, where, it is stated, attempts are being made to evade the Customs Act by German exporters forwarding goods to Holland, Switzerland, and other high-exchange countries, and then re-exporting them as the particular products of these countries. The Canadian Reconstruction Association, dealing specially with this subject, asserts that evidence is accumulating of efforts to ship German goods into Canada at illegally low valuations in violation of the Customs Act. It is also reported that offices are being opened in Holland for the definite purpose of handling German merchandise intended for Canada and for invoicing the goods in Dutch currency and as of Dutch origin.

Naturally, we are not aware what evidence is in the possession of the Canadian Reconstruction Association, but there is not the slightest doubt that the Germans are endeavouring to use other countries as the intermediaries for the disposal of German products as the manufactures of the countries utilised for this purpose, and of Holland in particular. Yet there is nothing really new in this German procedure. During the years of war many Dutch firms, it is regrettable to note, were the willing tools of the Germans in the attempted continuation under Dutch auspices of the former German trade, although the many devices which were resorted to for the purpose of deception were almost invariably discovered in England and were successfully frustrated. After the armistice, when the Germans began to understand the actual situation which they had created for themselves in the matter of world trade, they consoled themselves for a time with the reflection that they would always be able to find foreign merchants and others who would be willing to attend to the recovery of the former trade of Germany. In fact, they frequently boasted about this availability of foreigners for the express purpose of carrying on the trade, and the reports now received from Canada tend to confirm that the work of the intermediaries, or of the Germans in Holland, is already in full swing under the influence of the new situation created by the low costs of production in Germany due mainly to very low wages, combined with the effects on sale prices of the heavy depreciation of the mark, which latter was not foreseen when the resolve to make use of the services of intermediaries was originally announced after the armistice.

As bearing on the question, reference may be made to statements which were published in a Berlin newspaper —*Der Tag*—in July, when discussing the matter of trade with Holland. The writer states that numerous German firms established themselves in Holland directly after the armistice and found the conditions very favourable; they eventually, as is said, saturated the country with German goods. As to the future of these firms, the newspaper remarks that Holland is not the best site for "German export firms"—export firms, be it noted—so long as the florin preserves a value which is considerably higher than the mark. But all the time it is conceivable that these firms with a Dutch domicile have been elaborating their schemes to get the better, if possible, of the world by the camouflage of their manufactures as Dutch products.

Of course, there is another side to the question which indicates that the German commercial invasion of Holland is not only a serious matter to that country, but also that its risks are fully appreciated in some responsible quarters. Thus, for instance, a prominent Dutch banker, about a month ago, raised a strong warning against the German economic conquest of Holland. He drew attention to the various banking interests established by the Germans in Holland without any corresponding action on the part of the Dutch banks in relation to Germany, and to the great danger that in the course of time Dutch trade would in this way be diverted to the German banks in Holland; and as a further instance of the German invasion, he mentioned that the country was inundated with German travellers. The banker deprecated the idea of inviting English banks to extend their connections in Holland as a counterbalance to the German encroachment on the Dutch economic life, but the only remedy he was able to suggest was that the Dutch banks in their turn should establish banks in the large towns in Germany, England, France, and other countries.

We observe that the Canadian Reconstruction Association states that many industries in the United States have already suffered seriously from increasing exchange-aided importations of German merchandise, and figures are given in this connection of the large growth in German exports to the United States in the year 1920-21 as compared with the fiscal year of 1918-19. The comparison, however, is scarcely appropriate, seeing that the latter year comprised the final five months of the war and the first seven months of the still unsettled state of trade after the armistice. Nevertheless, all we can say is that as far as the United States is concerned, there will be precious little direct dumping of German goods into America after the United States Consuls get properly to work again in Germany, because the latter are specially qualified to assess at their real value the prices cited in the German invoices presented for the certification of merchandise destined for America. The certification of invoices by United States Consular officials is not a mere formality, as all who have had transactions with them know full well. It certainly takes a smart man—a very smart man indeed—successfully to deceive American Consuls as to the sale prices of German goods, or of those of any other country for that matter; and attempts to undervalue goods are almost invariably detected. If every allied country had a staff of men as Consular officials equally as qualified as are the Americans, and with the same duties to perform, and were also to insist upon certificates of origin—issued by the local Chambers of Commerce in the districts of production—it is probable that German schemes to deceive other nations would be, if not entirely frustrated, at all events reduced to a minimum; and under such circumstances it would also be extremely difficult for Dutch firms or firms of any other nationality to succeed in getting Consular certification for goods which, as a brief inquiry would very probably soon be able to prove, were not produced by any firm in the so-called country of origin but were "made in Germany."

Criticism of Japanese Methods.

We have heard a good deal at different times about the methods adopted by some Japanese traders. It is to be regretted that their good qualities and their general business alertness do not form the complete story. There are some things that we would rather not believe, and we are far from desiring to rush into print with any and every grievance that the Britisher home from abroad lays before us. Perhaps we are still more disinclined to say anything that might disturb our good relations with Japanese electrical and other business men. We feel, however, that silence would prevent the better type of Japanese trader from understanding how deep is the resentment in some British hearts concerning grossly unfair practices which they in the Far East will wish to prevent as far as their influence will permit. We are not referring to the marking of Japanese manufactures with British distinctive letters and labels, nor any of those other artifices which were complained of during the war years that were so full of difficulties for British exporters. We allude now exclusively to the opening of registered letters to British agents in Japan before they have been delivered to the addressees. An isolated case is not sufficient basis upon which to offer a Press criticism, and so long as it was isolated, though it was electrical, we said nothing about it in print. Now, however, the charge comes from another quarter, for a member of the Bradford Chamber of Commerce has brought forward his own experience. The facts are in agreement with those of our electrical complainant, and therefore confirmatory. Letters have been withheld from delivery for a time, and the information contained in them has been extracted and circulated to Japanese firms! The opening of letters before delivery to an addressee is itself in contravention of international postal regulations—but to give away the private information so obtained, to the detriment of the addressee and to the advantage of Japanese traders, is an execrable practice, sly and cunning, and deserving of the fullest possible exposure, whether it be the mean action of postal servants in the pay of traders or whether it be regarded with a blind eye by more important people. Sometimes the extractor or purchaser of information has been indiscreetly eager to make use of it, and has so given the game away to the aggrieved addressee as to make himself a laughing stock and a fool in British eyes as he has retired in confusion—but that is another story, and need not be told here. Where is the sense of fair play in men who will descend to such methods of competition? Such practices are even lower than those of the German banks in some foreign markets which before the war gave away to German competitors the prices being quoted by American manufacturers so as to allow the Germans to go one better and under-cut their rivals.

Diesel-Electric Coaches.

As the Swedish State Railway Administration has applied to the Government for permission to purchase three motor coaches from the German State Works at Kiel at a price of 60,000 kr. each, three Swedish companies have lodged a united protest against the proposal. These are the Allmanna Svenska, the Atlas-Diesel, and the Diesel Electric Wagon Co. At the same time the companies have asked the Government to institute a comparative inquiry concerning the Diesel electric rail motor coaches and the German benzine motor coaches. It is pointed out that the Swedish firms have carried out pioneer work in the direction of Diesel electric rail motor coaches, and that 12 of this type have been in service on seven Swedish private railways for the past eight years, possessing the advantages of reliability and low working expenses. It is contended that the Swedish type would become discredited both at home and abroad if the German coaches were sanctioned, and that the working costs with the latter, using benzine or benzol, are from five to six times greater than the cost with the Swedish coaches.

According to a correspondent of the *Manchester Guardian Commercial*, at least one British railway company is considering the adoption of a portable gas producer, gas engine, dynamo, and motors for the propulsion of trains. Probably, Capt. W. P. Durtnall is at the back of the proposal, as he has advocated the use of internal-combustion engines and electrical transmission on ships, locomotives, and omnibuses for many years, and a Tyneside firm is building such locomotives under his patents.

The Engineers' Club.

The progress of the Engineers' Club (London) during the first month of its career has been, we understand, all that could be desired. The membership is over 3,300, as was anticipated by the Committee, and the average income from subscriptions is much higher than had been allowed for in the preliminary estimates, indicating that the proportion of town members to country and oversea members has been well maintained. So far as we are aware, the arrangements made by the Committee have met with the approval of the members, and there is no doubt that the Club is already fulfilling its purpose in becoming the recognised rendezvous for engineers whenever they are in London; one cannot enter the premises without meeting a number of professional acquaintances. We understand that developments are in progress with a view to providing for the comfort and convenience of members who have little time to spare for the midday meal and require "quick lunch" facilities; and attention may again be drawn to the advantages offered by the Club for dinner parties, reunion dinners, and similar social functions on a moderate scale, of which so many are held in the course of a twelvemonth.

The Club is still a young institution, and some time must necessarily elapse before it is working at the highest efficiency and load factor, but it has already done so well that, with the hearty co-operation and goodwill of the members, it may be counted upon as a permanent institution, which fills the want that has been so keenly felt for many years, and which will probably develop eventually into a vastly bigger and more important concern than is generally imagined. Perhaps it is the nucleus of an Engineering Union rivalling in importance and utility the famous establishment in New York, and bringing together the great British Engineering Institutions in one powerful organisation.

Electric Power in Norway.

Although the utilisation of water power by private enterprise for hydro-electric works in Norway has been hampered for many years past by legislative restrictions in the matter of concessions and the high taxes imposed on the undertakings, it has yet been possible to establish certain privately-owned works in addition to those which have been constructed for the account of and working by the State. If these works had been in existence ten years ago the supply of power would have assisted in the development of existing, and the creation of new, industries, but this possibility is out of the question now under the industrial depression prevailing in Norway, and the difficulty experienced in raising capital for private enterprise. Under the circumstances, it is not surprising to hear that considerable quantities of energy available at existing hydro-electric works are finding no profitable use. This state of affairs is said to apply not only to the large works at Tyssedal, but also, to a greater or lesser extent, to all the hydro-electric works in Norway. Even the State works at Glomfjord, which has 50,000 h.p. at disposal, and can be extended to 75,000 h.p. or 100,000 h.p., is awaiting big customers for the power, which is declared to be too dear at from 30 kr. to 50 kr. per horse-power-year. The power available at the Glomfjord works has also been offered to the German Hugo Stinnes, but the offer is said to have been declined. Hydro-electric works established in war time and at the prices then prevailing, and also for some time after the conclusion of hostilities, are not entertaining propositions from the standpoint of supply charges to consumers; hence the large amount of energy for which no users can be found at the present time.

ENGINEERS AND THE CAMERA.

By J. WALKER.

Nowadays everyone knows how popular the "travel" and "things of interest" pictures are in our kinemas, and it is because of this that the following lines have been put together to show how engineers can make use of the camera to make their own pictures of "travel" and "interest." The camera should become part of the engineer's kit. Why not? The engineer from the first day he enters his apprenticeship is taught how to read a blue print which, after all, is a photograph.

The author always made it a point when going on to a repair job or the laying-down of a new installation first of all to make certain that his camera and slides were packed safely with the tools, papers, &c., to be used on the job. When a repair was to be carried out on a machine at some distant colliery, 20 to 30 miles away from headquarters, the camera was found very useful for taking pictures of the actual parts broken and for explaining the state of affairs to the chief, when he found it impossible to be personally present at the breakdown. Many a time spare parts have been looked out and temporary patches made up there and then with the aid of photographs.

Tradesmen who may have been sent out to a job, and who have had to go back to the shop for some spare part, will know the difficulty they have experienced in

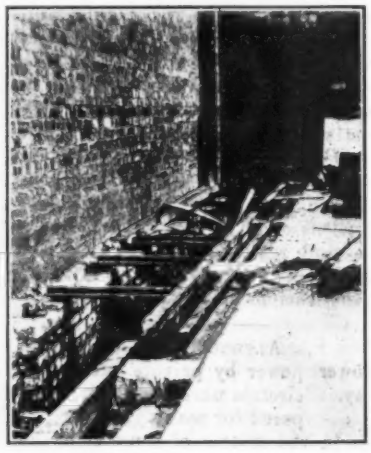


Fig. 1.

getting other people to understand what they actually wanted. By the use of even the crudest of pictures the "explaining" can be very easily done.

Some may say: "It's all right, but you can't take pictures of every little thing, and what would the boss say, any way, about wasting time?" There is certainly no need to take every little thing, but, of course, one would be able to form his own opinion as to what he should take. It may be worthy of mention that as regards "little" things the author has numerous photos of bent bolts and nuts, sheared cotter pins, and pins just being sheared, but which were caught in time before actual damage was done. As regards what the boss would say: well, nowadays chiefs have, or should have, more gumption than to say it would be a waste of time taking pictures of any pieces of plant or general surroundings in which they themselves were personally interested. The author knew some chiefs who were very grateful for pictures which enabled reports to be drawn up and the situation grasped even although they themselves were not actually on the ground.

Fig. 1 shows a power station floor cut up for the running of cables in the duct. The channel and angle irons across the gap serve the double purpose of supporting the rack insulators for the cables and also for supporting the floor, which was laid after all work was completed.

This same picture is to-day in the hands of the chief who finds it very convenient for going over the job (in his own chair) with his foreman, when new cables are to be run or any alteration is to be carried out.

Fig. 2.

This picture brings out a point to which special attention should be drawn. Chief engineers and their staffs are well acquainted with the fact that when a job crops up a good deal of planning and discussion takes place in the office even before a man has been put on the actual work. It will be granted that much pencil and paper, as well as time in explaining things, would be saved by the use of photographs. Take fig. 2, for instance. This shows the working parts of an electric trolley used in a factory. This picture was very often

Fig. 3.

used by the chief when any instructions were to be given as regards the charging of the accumulators, or when special attention was to be given to other parts. One can see that a lot of running about can be done away with, and the same result can be got by going over the photograph as by going down to the actual job.

Fig. 3 is a bird's-eye view of the power station on the erection of which part of the author's apprenticeship was served. This picture serves the double purpose of being of interest as well as reviving pleasant memories. How many to-day would like to have an old photograph of their "ain wee corner" of the workshop in which they served their apprenticeship.

Fig. 4 shows a small lighting plant installed in the Highlands of Scotland many miles distant from the headquarters of the young engineer who laid it down, and

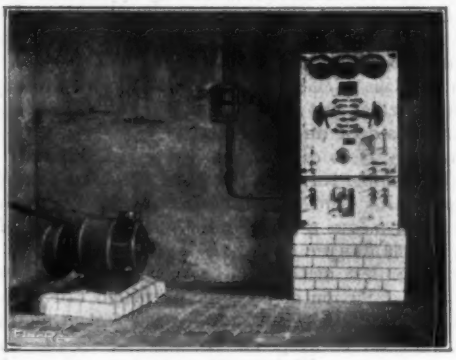


Fig. 4.

who made use of his camera when the job was completed. One can quite understand how proud he was to come home to his chief and say: "That's it. What do you think of it, sir?"

Many a time engineers on reading a book come across a drawing or a photograph of something of special interest, and often wish they could have a copy. Without a camera their only means would be to cut out the page, and thus destroy the book or, on the other hand, they would require to make a tracing. This in itself would perhaps put the idea out of their heads, but with the camera the actual page could be taken. Fig. 5 shows a drawing which was specially required without cutting it out.

Enough has been written to show how useful the camera can be to the engineer, but in addition to the

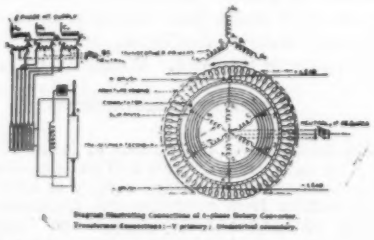


Fig. 5.

uses already mentioned, there is one to which more attention should now be paid, namely, to make use of the camera in the interests of our apprentices.

Photographs play a very important part in the training of our young engineers, be they electrical, mechanical, mining, or marine. The pages of our journals and text books are more easily understood when photographs are used to illustrate various points.

Young engineers should be encouraged to take pictures of machinery in their works, and be allowed to make use of them for lantern slides, which in turn would be shown and described before local engineering societies. By so doing the young men would be educating themselves as well as others.

The author knows of no better means of "drawing out" our apprentices than the getting up of a paper for discussion at the engineering clubs, which paper would be illustrated and adorned by means of lantern slides. Of course it is no new idea for apprentices to give a paper on "Apprentices' Night," but very few papers (perhaps for want of pluck to ask the chief's permission to take them) are ever illustrated by pictures.

The engineering clubs and societies should certainly take up the matter, and give the necessary encouragement for the presentation of illustrated papers, especially in these days, when everyone "wears" a camera.

As regards apparatus—perhaps the works "official" photographer knocks all the stuffing out of the young fellows in the workshops when they see him coming down with his assistant carrying a large camera and a heavy stand, but there is no necessity for special apparatus. It is necessary, of course, for the works manager to have the very best pictures for his catalogues, but for the young engineer's purposes a much smaller and cheaper outfit is sufficient.

Then again, the pictures of machinery and breakdowns do not require to be "works of art." So long as they serve their purpose, that is all that is wanted.

A quarter-plate folding type plate camera with a focusing screen answers the requirements very well.

"TURNING" versus "GRINDING" OF COMMUTATORS.

By JOSEPH T. TOWLSON.

An esteemed contributor (Mr. Owen Linley), writing on "The Grinding of Commutators" (Electrical Review, September 2nd, page 303), while making a case for the advantages of grinding, and deprecatory to the turning of commutators, put forward some most peculiar remarks.

I hope, in the following statements of facts and of personal experience, to throw a little light on the subject, and if I am compelled to give a gratuitous advertisement in respect of the qualities of motors and generators of a particular company's manufacture, I hope to be forgiven, my only object in so doing being that what I write shall ring true and indisputable. It is, moreover, open to investigation.

The India-Rubber, Gutta-Percha & Telegraph Works Co., of the island of Silvertown, has running in its factory about six hundred motors and generators ranging from 1 to 1,000 kW. The company has also the upkeep of many motors and generators working at various factories in the vicinity, and it has manufactured many hundreds of these machines for outside customers, which come under our observation at very long intervals, though, when repairs are necessary, the company has the work to do. *Among all these innumerable machines, not one commutator has been ground.* They are well prepared, rock hard, and substantial, the amount of copper in the sections being generous. They are turned, and buffed with glass-cloth or emery-cloth, the cloth being simply held in a block of wood cut to the curve of the particular commutator and extending about 20 deg. around its periphery. No special tools are used—just suitably-ground single-point tools—and the copper is turned at a speed of 200 ft. per minute, and buffed at about double that speed. No trouble is met with in respect of the true running of the armature shaft, the resources of the turning shop in respect of men and means being amply equal to making any shaft run true within "half a thou." in quick time. The writer has been in charge of such work for many years, and to his personal knowledge no difficulty has been met with as regards the operation of turning "coms." of any size, nor has he found any case where the turned commutator has failed.

There are motors running in that factory of various ratings, which have run all but day and night for 15 years, and have never been touched. Day after day and year after year they take up their respective loads, and the only attention they get is the weekly supply

of oil to their ring-oiled journals, and a puff or two with a blower, wherewith to disperse the carbon dust. No special men are deputed to turn the "coms.," and they are done, and well done, frequently by lads in their teens.

Large commutators from 100 to 1,000 kW are turned and buffed in their places quite easily, while the "coms." of lesser powers are taken out and turned and replaced in less than two hours.

It is a significant fact, and an absolute proof of the durability of the Silvertown turned commutators, that though there are six hundred to keep in repair, the men whose duty it is to attend to the repair work are frequently out of a job. The durability of a modern commutator designed as it should be, and turned and buffed, challenges most emphatically any statement made derogatory to turning; and fine colour is lent to such challenge by the fact of a Silvertown commutator running for over 15 years in a machine shop, exposed to all the dust and dampness which appertains to such shops, with the minimum of attention. Any who may hold a brief for the grinding way are welcome to their faith, though I am certain that, did they adopt the turning way as is done in Silvertown, they would be surprised and satisfied at the result.

THE IDEAL ELECTRIC KITCHEN.

By MARY GWYNNE HOWELL.

There is no doubt that the all-electric kitchen will be the highest mark of efficiency in the labour-saving house of the future.

Although conditions are not favourable at the moment, yet there is always the hope that "somehow" and "some time" electricity will be sufficiently cheap and plentiful to be adopted as the *universal household servant*, for heating, cooking, and driving appliances, as well as for lighting. With such future popularity in view, it may be as well to consider particulars which are likely to find favour with the housewife.

Looking at it from the point of view of *electricity taking the place of servants*, there are several things to be remembered:—

1. The ideal electrical equipment consists not of a multiplicity of electrical utensils, but of appliances capable of a multiplicity of tasks.

The busy housewife is not much better off for electrical appliances so numerous and intricate in design that they take more trouble to keep clean than the old-fashioned pots and pans. Electric toasters and grillers, coffee pots, immersion heaters, and hot plates, are perfectly delightful regarded singly, but a thorough collection of them will entail quite a lot of cleaning and polishing, and this "aftermath" is a point of considerable importance to the servantless housewife. On the other hand, what a treasure beyond price to such a woman is a general utility motor, with its "magic" attachments capable of cleaning the silver and brass, shredding the vegetables, chopping the meat, beating the cakes and batters, and suchlike tasks. These are time-taking and energy-expending jobs, and an appliance that will accomplish them swiftly and efficiently will find high favour in the eyes of the home worker.

2. Of all hated tasks possibly *washing up* will take first place. Why? Because it is "messy"; it takes up at least half an hour of precious time three or four times a day; it involves much muscle and step motion; and—the biggest grievance—it has no lasting results. It is not a "worth-while" job, and yet there is no escape from it. There is, then, a real need for electrical dish washers, and provided they are safe, efficient, and reasonable in price, such appliances will be hailed with delight in the servantless kitchen.

3. Practically all the major household machines should be considered as fixtures. Washing machines, clothes driers, ironers, ironing boards with their accessory electric irons, dish washers, &c., all require convenient and adequate connections to gas, electricity, water supply, and drainage.

At the moment, perhaps, this need is not very apparent, since such appliances are in the experimental stage as far as the housewife is concerned, but once the all-electric kitchen becomes an everyday affair instead of a novelty, it will be essential to arrange the appliances logically, install them permanently, and utilise them intelligently. By such means household management will be placed on a business basis.

Apart from actual labour-saving appliances there are still matters in which the practical utilisation of electricity in the kitchen is possible. Of these the most important are ventilation and illumination.

In no place is efficient ventilation more necessary than in the kitchen, yet there is seldom any provision made beyond the door and windows.

Not only is it difficult to keep the kitchen at an equable temperature, but any attempt to keep it cool while cooking is progressing often means a draught, and a draught means a cold for the cook, and a cold for the cook means danger to the whole household.

The simplest method of overcoming this difficulty is by the installation of a motor-propelled fan in a panel in the upper sash of a window. The fan in motion will draw out all cooking odours as well as the hot air, and, moreover, will keep the air in motion, which is a desirable factor in all ventilation.

Since cooking odours in the house are closely connected with inefficient ventilation a hood over the cooking stove is a great asset, and when a blower operated by electricity is connected with the hood, it is possible to draw off all cooking odours directly, without giving them a chance of pervading the hall atmosphere.

And not only in the kitchen, but throughout the house is added ventilation by means of electrical appliances a point to be considered.

Electric lighting has reached a stage of efficiency beyond criticism, and it is probably the housewife's fault rather than the electrician's that her kitchen is not as a rule adequately lighted. At the same time, the installation of lamp sockets in such positions as to ensure a good light at the sink and the stove will make her realise how important are such details.

In conclusion, domestic difficulties invite mechanical help, and nothing but the cost of electricity deters its general adoption. Everything but the price is in its favour, and could this difficulty be eliminated electricity and electric appliances should reign supreme in every house in the land. What can be done about it?

Battery Locomotives on the Isle of Man.—Visitors to the Isle of Man this year will have had an opportunity of seeing what can be done by the storage battery to solve the problems of transportation from aesthetic and utilitarian standpoints. At Groudle Glen, near Douglas, one of the "show" places of the island, there is a miniature railway which previously had been operated by steam locomotives, but has now been converted to use storage battery locomotives. The two locomotives used were supplied by British Electric Vehicles, Ltd., and each is driven by 40 I.M.V. 10 Exide-Ironclad cells.

These neither obtrude themselves on the landscape nor obscure the view of passengers. Steam locomotives seem to have a special trick of emitting clouds of steam when passing through the more beautiful parts of the route. If the object of the passenger is merely to get from one point to another as quickly as possible he may not be worried by this screen between himself and the scenery, but when he has come expressly to see it, and the line has been built for this purpose, it is decidedly irritating to have the engine driver ring down the curtain so frequently.

Where the gradients do not rule it out, the storage battery locomotive has advantages also over the trolley locomotive in such work as that at Groudle Glen. The erection of the overhead equipment necessarily involves the cutting back of trees to prevent short circuiting and "earths"; and the railway becomes most conspicuous in those places where the natural surroundings demand that it should remain concealed.

The enterprise of the directors of the Howstrake Estate in developing the attractions of Groudle Glen through the substitution of the battery for the steam boiler could be studied with benefit by others interested in similar projects.—*Electric Vehicle.*

ELECTROCULTURE.

By "ANODE."

A few years ago, several large experiments in electroculture were carried out in various districts; while the results obtained were very encouraging, we have not been favoured by the authors of these experiments with any data on the subject of late, and this must serve as my apology for putting forward the results obtained by me in a small garden with apparatus within the reach of all, and, moreover, entirely independent of a generating station, perfectly safe, and productive of a large amount of pleasure and interesting incursions into other branches of science.

The apparatus consisted of a trembler coil capable of giving a 2-in. spark with a 6-volt accumulator, several bobbin insulators, some heavy gauge copper wire, and 2 oz. 24 S.W.G. S.C.C. copper wire.

The plot of garden was 30 ft. by 18 ft., and the heavy copper wire was strung from end to end both sides of the plot, insulated at each end, while the light wire was suspended across the plot from the heavy wire on bobbin insulators, at a height of about 4 ft.

This enabled me to move the overhead equipment up to one end for convenience in cultivation, digging, weeding, &c.

As the voltage was extremely high it was necessary to affix danger notices, and I soon found that a great deal of interest was taken in the experiment by all and sundry, but after a time the novelty wore off, and callers were few and far between; as I did not want any accidents, I did my best to discourage visitors.

A peculiar effect I noticed was that if you held the end of a dry walking stick near the high-pressure wire, a blue glow was seen round the ferrule, and, in fact, this constituted a very good way of finding out whether the conductor was continuous, as owing to the exposed situation of the garden, breakages were frequent.

One night I landed home with a friend, to whom I was anxious to show the equipment; on the way up I mentioned the corona effect, and proceeded, on our arrival, to demonstrate it, but forgot for the moment that I was doing so with an umbrella with a steel stem. I was forcibly reminded of it by the ensuing shock which afforded my friend considerable amusement.

The next sufferer was the dustman, whom I had warned of the great danger of getting too near the line, and really he had no right to say what he did, for he distinctly said: "That's all right, guv'nor, leave it to me, I know all abaht it." He did, and the cause of his enlightenment was that, after taking the dustbin out, he returned with it on his shoulder and turned round to dump it in its accustomed place; he proceeded to lower it very carefully, and placed it on the live wire.

He kept on for at least five minutes, and never repeated himself. I never thought the English language was so rich in invective, and on my suggestion that he should enter for the Billingsgate championship, he went off again at synchronous speed till at last the fuses blew.

My wife was distinctly of the opinion that the largesse paid to this horny-handed son of toil should not be charged to the garden account; but women have no sense of perspective. Personally, I thought it cheap at the price.

Incidentally, the dustbin on reaching terra-firma flattened out a seed bed of onions, and carried away a portion of the overhead equipment, which dropped on to a promising row of peas and electrocuted them.

Sultan, a poodle of uncertain origin belonging to my neighbour, began to take a great deal of interest in the garden, and evidently arrived at the conclusion that it was just the place to hoard his treasures, so one day I suspended a nice meaty bone from the wire just about a foot from the ground, and stationed myself at the switch inside the house and awaited developments.

His lordship appeared, I switched off, he got the bone nicely in his jaws, and I switched on. Sultan was immediately taken with a combined attack of lockjaw, locomotor ataxy, general paralysis, hemiplegia, and strychnine poisoning, and struck dumb into the bargain. The physiological effects were remarkable, and variegated displays were easily obtained by quickly switching off and on.

As he appeared to be suffering somewhat, I switched off, and he seemed to imagine that he was a series-wound motor running on no load; in his revolutions and evolutions round the garden, he shipwrecked everything that the dustman had missed.

His owner witnessed this interesting experiment, quite unknown to me, and was of the opinion that it savoured of vivisection with a dash of Bolshevism thrown in, but this I strenuously deny, and for my own part I consider that Claude Bernard was a back number in scientific researches of this nature.

It took me about a month to get things all square again, when we had a visitor, a young lady from the country, who was greatly interested in this latest method of food production. She was of the opinion that I greatly overestimated the danger of touching the line, and one day carried out the experiment on her own account.

As she had been brought up in a refined home, and carefully shielded from all worldly taint, she was at a loss what to say, but the Athanasian creed and extracts from the Psalms supplied the deficiency. She then entered into a searching and critical analysis of my past, and finished up with a lurid description of my future destination.

And there was silence for half an hour . . . when my wife discovered that the accumulator was leaking, and had burnt a hole in the dining-room carpet.

On my return home next evening I found the whole outfit scrapped; but though my experiments did not lead to any new facts being discovered in the horticultural line, I have every confidence in recommending an electroculture outfit to those in search of cheap and refined amusement.

IMPORT TRADE OF CHINA.

The following table shows the value (and where possible the weight) of China's imports in 1920 of material of interest to the electrical and allied trades, indicating the principal countries of origin. The figures for 1919 are given in comparison, and notes of increases or decreases are added. The advance in Chinese purchases is striking, and it is noteworthy also that Great Britain is regaining its share rapidly. It is probable that the trade credited to Hong Kong was to a fair extent transacted with the United Kingdom.

The Chinese picul = 133⅓ lb. average, and the Haikwan tael = 6s. 4d. in 1919 and 6s. 9½d. in 1920.

Country whence imported.		1919.	1920.	Inc. or dec.
Aluminium, manufactured.—				
Total	piculs	1,760	1,040	– 720
	taels	287,000	70,000	– 217,000
Japan	piculs	1,590	613	– 977
	taels	275,600	45,000	– 30,600
United States ...	piculs	160	265	+ 105
	taels	10,000	15,000	+ 5,000
Brass and yellow metal; bars, sheets, wire, &c.—				
Total	piculs	27,000	44,500	+ 17,500
	taels	860,000	1,224,000	+ 364,000
Hong Kong ...	piculs	8,600	10,900	+ 2,300
	taels	247,000	318,000	+ 71,000
Great Britain ...	piculs	1,690	15,470	+ 13,780
	taels	56,000	298,000	+ 242,000
Japan	piculs	15,000	16,500	+ 1,500
	taels	468,000	505,000	+ 37,000
Canada	piculs	1,330	14	– 1,316
	taels	54,000	1,000	– 53,000
United States ...	piculs	542	1,980	– 1,438
	taels	32,000	81,000	+ 49,000

Country whence imported.		1919.	1920.	Inc. or dec.
Copper, bars, rods, sheets, plates, nails, and wire.—				
Total	piculs	40,000	60,000	+ 20,000
	taels	1,334,000	1,900,000	+ 566,000
Hong Kong ...	piculs	430	810	+ 380
	taels	15,000	26,000	+ 11,000
Great Britain ...	piculs	988	3,000	+ 2,012
	taels	23,000	94,000	+ 71,000
Japan	piculs	36,000	55,000	+ 19,000
	taels	1,209,000	1,768,000	+ 559,000
Canada	piculs	917	122	– 795
	taels	29,000	3,000	– 26,000
United States ...	piculs	1,460	6,000	+ 4,540
	taels	50,000	22,000	– 28,000
Machine belting.—				
Total	taels	768,000	1,540,000	+ 772,000
Hong Kong ...	taels	58,000	78,000	+ 20,000
Great Britain ...	taels	296,000	645,000	+ 349,000
Japan	taels	230,000	264,000	+ 34,000
United States ...	taels	170,000	521,000	+ 351,000
Electrical materials and fittings.—				
Total	taels	5,170,000	6,515,000	+1,345,000
Hong Kong ...	taels	398,000	319,000	– 79,000
Great Britain ...	taels	285,000	954,000	+ 669,000
Italy	taels	288,000	39,000	– 249,000
Japan	taels	2,303,000	2,624,000	+ 321,000
Canada	taels	227,000	304,000	+ 77,000
United States ...	taels	1,622,000	2,012,000	+1,390,000
Machine tools.—				
Total	taels	500,000	761,000	+ 261,000
Great Britain ...	taels	50,000	111,000	+ 61,000
Denmark	taels	21,000	1,500	– 19,500
Japan	taels	222,000	317,000	+ 95,000
Canada	taels	28,000	22,000	– 6,000
United States ...	taels	169,000	284,000	+ 115,000
Propelling machinery—as boilers, turbines.—				
Total	taels	1,640,000	2,376,000	+ 736,000
Great Britain ...	taels	292,000	1,018,000	+ 726,000
Japan	taels	162,000	202,000	+ 41,000
Canada	taels	108,000	140,000	+ 32,000
United States ...	taels	799,000	655,000	– 144,000
Machinery, other, not textile, brewing, refining, &c.—				
Total	taels	8,417,000	12,444,000	+4,027,000
Hong Kong ...	taels	658,000	426,000	– 232,000
Great Britain ...	taels	918,000	2,172,000	+1,254,000
Japan	taels	2,320,000	2,122,000	– 198,000
Canada	taels	740,000	399,000	– 341,000
United States ...	taels	2,618,000	6,774,000	+4,156,000
Telegraph and telephone material.—				
Total	taels	940,000	1,889,000	+ 949,000
Hong Kong ...	taels	60,000	25,000	– 35,000
Great Britain ...	taels	67,000	365,000	+ 298,000
Japan	taels	406,000	1,150,000	+1,744,000
Canada	taels	103,000	73,000	– 30,000
United States ...	taels	151,000	202,000	+ 51,000

THE PROVINCIAL ELECTRIC SUPPLY COMMITTEE OF THE UNITED KINGDOM.

The annual meeting of the Provincial Electric Supply Committee of the United Kingdom was held on Tuesday, September 27th, Sir Harry Renwick, K.B.E., the chairman, presiding.

In the course of a general review of the work of the past year, the chairman said with regard to the Joint Electricity Schemes that, generally speaking, there was one point on which he thought all agreed, namely, that the chief concern of most of the provincial companies was whether they would be able to get a cheap bulk supply without having any rights infringed by competition or otherwise. If many of the smaller companies, whether in London or in the provinces, could safely get bulk supply at a low price it would be the best thing that could possibly happen to them, and in many cases it would prove their salvation. With regard to labour, he said that at present there was a period of quietness so far as the electricity supply industry was immediately concerned, all questions regarding workmen being settled by the Industrial Councils, and the adjustment of salaries of technical staffs coming under a continuing agreement made by the National Joint Board.

He explained the reconstruction of the National Council, and said that the Committee felt it was the view of the majority of its member-companies that it should fall in with the new proposals. Broadly speaking, it was possible that a more satisfactory position might be forthcoming, although there was always the difficulty of getting suitable representatives who could and would give up the necessary time to what everyone agreed was a very thankless task. The Committee had assisted the Ministry of Labour scheme for providing suitable employment for disabled soldiers.

The Committee had carefully watched all legislation introduced during the past year, and acted in the companies' interests with regard to any measures that required attention. It had been in negotiation with the Ministry of Transport with a view to an Increase of Charges Bill being introduced to cover the cases where an increase of maximum price was necessary, but did not come within the scope of the present Electric Lighting Acts, but in view of the Electricity Supply Bill having been brought forward, wherein a special revision clause had been inserted, this had to be dropped.

The assistance which the Committee had been able to give to individual companies in matters of a domestic character had been very much appreciated; it had acted in concert with various other associations, Committees of the I.E.E., E.D.A., and so forth, and had been able to meet all the expenses out of the annual subscriptions.

On the motion of Mr. W. A. Scott, supported by Mr. A. A. Campbell Swinton, the Executive Committee was re-elected *en bloc* for the ensuing year. A vote of thanks was accorded to the chairman, the Executive Committee, and the Secretary for their services during the past year. A general discussion on various matters took place, and a resolution was passed that the Unemployment Committee should be asked to receive a deputation from the Provincial Committee with a view to obtaining financial support for the smaller electricity supply companies for the purpose of extending their supply, and thus finding work for the unemployed.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Accumulator Froth.

Truly the reply of the Ediswan Accumulator Department's Manager amply substantiates the suggestion in my letter that the makers are not taking a reasonable attitude with regard to the question of frothing of cells.

Mr Coates says that the painting of the inside of the boxes would eliminate the transparency. I fear his knowledge of the number of transparent paints available must be very limited; but what is the use of making suggestions when the manager of a reputed firm in his last paragraph says: "They have to cater for the demand, not dictate to the public"?

This can only be interpreted in one of two ways: either that accumulator makers are willing to sacrifice their reputation and supply an article which they know is bad in use; or that there is a demand for accumulators that froth. I think that this deplorable sentence must have been written hastily. Surely, since the general consensus of opinion indicates clearly that in a large number of cases celluloid containers or separators cause frothing, the chemistry of this frothing should be properly investigated, and if by mechanical means it cannot be prevented, then an alternative to celluloid should be substituted.

The writer is personally of opinion that there is a multiplicity of ways for overcoming the evil, and it should not be beyond the chemical knowledge of accumulator makers to deal effectively with the situation.

Imagine someone buying a Rolls-Royce car and fitting it with self-starting apparatus (the batteries being in celluloid cases). After a small interval it is found that these cells froth and an acid slime attacks all the metal work in the vicinity. I ask Mr. Coates, would he knowingly sell an accumulator for such, even if the demand were there, without notifying them that frothing would probably result in a short time? His letter suggests that he would. Mr. Coates has much to learn about celluloid. If he will examine outside the cases where the froth oozes out he will find that even the polish on the celluloid becomes so greasy that, in certain cases, the decomposed face of the celluloid can be wiped off.

Thos. Hesketh,
Managing Engineer,
Folkestone Electricity Supply Co., Ltd.

Folkestone.
October 3rd, 1921.

A Spare Armature Incident.

The other day I was called to a motor which, I was told, sparked badly. It was a shunt-wound interpole machine, 460 V, 10 h.p., of the ball-bearing type. On examination I found the armature tight, and suspected a broken cage in the pulley end bearing. Eventually the pulley was removed (I said eventually, because the key was nicely cut off flush with the shaft, and needed a specially shaped drift to drive it out—even then it was an awkward job. I cannot understand why makers will persist in cutting shanks off keys after fitting, it is much easier to get a pulley off if the key can be drawn easily). On examination of the bearing it was found that the cage and balls were smashed to bits; this of course had

let the armature rub and destroyed the bands. As the machine was urgently needed we decided to put the armature of another identical machine of the same make and type, 460 V, 10 h.p., in place of the damaged one. On starting, the motor ran in the opposite direction, and of course sparked. I reversed the field current to change the direction of rotation, but then before getting the starter right over we had a brilliant display of fireworks; this occurred at all brush positions. I should be obliged if someone could explain why this occurred. From the above experience it seems to me that it is necessary to keep a spare armature for each machine, even if all the machines are of the same make, type, size, and voltage, whereas one ought to be sufficient. The damaged armature after repairs ran O.K. in its own carcass, proving that the field system was all right.

F. W. G.

September 29th, 1921.

[Probably the relation between the armature, the interpoles, and the main field was incorrect. The subject was fully dealt with in our issue of August 2nd, 1918.—Eds. Elec. Rev.]

Support for French Industries.

I have often noticed how active Swiss, German, Dutch, Swedish, Norwegian, and even Austrian firms have been with their publicity and their representatives in this country, and how seldom we hear from the French.

The war proved that none of the others had all the brains. How seldom we hear of French motors, transformers, or even lamps being supplied to us, as compared with machinery, &c., from the other European countries mentioned.

I think we should, and would, offer a warmer welcome to the engineers and products of our very gallant Allies in the late war.

C. T. Allan,
Assistant Manager,
South Wales Electrical Power Distribution Co.

Cardiff.
October 1st, 1921.

The E.P.E.A. and the E.T.U.

My attention has been drawn to the paragraph headed "The E.P.E.A. and the E.T.U.," and I have to point out that no working agreement will be arranged between the two organisations unless agreement can be reached on demarcation of membership. To show the feeling that has arisen between the unions, parties to the No. 10 Area Council, I am enclosing a copy of a letter that I was instructed to write as secretary of the Trade Union side of the said Council. No reply has yet been received.

W. J. Webb,
London District Sec. E.T.U.,
Sec. T.U. Side, No. 10 Area Council.

London.
October 4th, 1921.

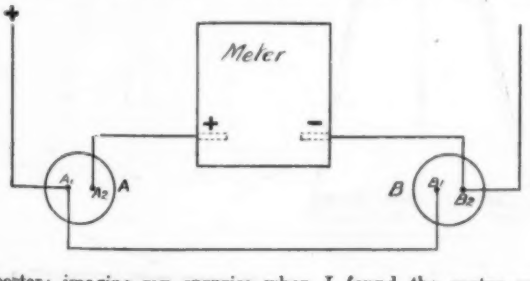
[The letter referred to, addressed to the Secretary of the E.P.E.A. and dated September 27th, stated that the full Trade Union side of No. 10 District Council had resolved that unless the Electrical Power Engineers' Association confined its organisation in the area to the grades covered by the Stoker award, transferred back to the Unions concerned men admitted to membership outside that category, and undertook that no further encroachment should take place, the Trade Union side would break off all negotiations with the E.P.E.A. —Eds. Elec. Rev.]

A Sensitive Meter.

The accompanying diagram is an arrangement for cutting out of circuit a 20-amp. Chamberlain & Hookham meter in series with a 400-volt (d.c.) 10-h.p. booster.

Of course, as the diagram shows, with switch A closed and B open, the meter will revolve, and with B closed and A open the meter will remain stationary.

Some time last week I closed both switches and started the



booster; imagine my surprise when I found the meter revolving, slowly, but quite fast enough to be immediately detected.

The length of cable between points A_1, B_1, and A_2 and B_2 is only a matter of about 2 ft., so the drop across the terminals of the meter is practically negligible.

This is surely a fine testimonial to Messrs. C. & H. for a small starting torque.

Surprised.

October 3rd, 1921.

The Glasgow Hiring Scheme.

In your issue of September 23rd, page 408, in an article dealing with the Ideal Homes Exhibition, Glasgow, the statement is made that "importance is attached to an American 'Universal' cooking range, which, we understand, the Corporation intends to put out for hire shortly."

I do not know where your correspondent got his information, but it is not quite accurate. It is true the Corporation is about to hire out electric cookers, but the cookers will be of British, not of American, manufacture. It is well known that American cookers cost three times as much as the British article, but apart altogether from price, the present is not the time to go past the home manufacturer for apparatus of this kind.

R. B. Mitchell,

Electricity Department,
Glasgow. *September* 29th, 1921.

Organ Blowers.

I have been interested in perusing the replies of your correspondents to the inquiry which appeared in your issue of September 16th, signed by "Organ Blower."

Generally speaking, my experience, which has extended over a period of nearly 30 years, goes to show that in the application of electric motors to organ blowers no difficulties are presented when a new installation is in contemplation.

Many organ builders still prefer the old-fashioned three-feeder system of supplying wind to the main reservoir of an organ, and where direct current is available this can be arranged for in a very simple and direct manner, the motor being either connected to the 3-throw crankshaft by means of a silent chain drive, or in smaller installations by belt drive. In these cases the crankshaft is usually designed to run at a maximum speed not exceeding 40 r.p.m., the motor running at a maximum speed not exceeding 240 r.p.m. Absolute control of the speed can be obtained by a regulating resistance placed in the armature circuit of the motor, which reduces the speed of the motor to zero when the bellows is full. The regulator can be provided with starting steps as well as with regulating steps, so that when the current is cut off the bellows gradually empties itself and the controller is brought round automatically on to the starting position, with the result that the starting resistance is introduced ready for the next start up. Organ-blowing motors provided with this form of controller (which was the subject of one of my old patents now lapsed) can be started or stopped by closing an ordinary single pole or double pole switch placed in a convenient position near the keyboard. Alternatively, the controller can be provided with an electrically-operated switch controlled by a pilot circuit connected to a switch or push button at the keyboard; this arrangement has the advantage of saving heavy-current wiring having to be carried to the keyboard.

Generally speaking, I would recommend, where alternating current is available, the installation of a rotary blower, the motor being either direct coupled to the blower or coupled by endless belt drive.

There are many excellent blowers now manufactured to select from, in all of which confidence may be placed, and they can be run for many years without attention of any kind. The advantage of using a rotary blower is, of course, that it can be placed in a small chamber, vestry or basement near the organ, where the slight humming noise inseparable from a.c. motors is sufficiently isolated to prevent any objectionable noise being heard in the church.

The difficulties in connection with the driving of organs commence where existing arrangements, either hand blowing, hydraulic blowing, or direct driving by continuous current motors, have to be converted due to alteration in the supply or for some other reason. Such cases have to be considered individually on their merits, and a wide experience in the application of alternating-current motors to these installations proves that the difficulties can frequently be satisfactorily solved by the direct application of a single-phase or 3-phase motor, which can be easily started from the keyboard.

One of your correspondents has referred to the possibility of applying a single-phase constant-speed motor to an existing 3-throw crankshaft blower through the medium of a countershaft fitted with fast and loose pulleys, the fork controlling the belt being controlled by the rise and fall of the main reservoir, and in many cases with which I have been acquainted, this arrangement has proved entirely satisfactory, but there is another method in connection with this form of drive which calls for special mention, and that is an arrangement of valves in the reservoir by which the wind supply is controlled irrespective of the speed of the crankshaft, which runs at a constant speed and does away with the necessity for the fork striking gear and fast and loose pulleys.

The most satisfactory form of a.c. motor for driving these various forms of equipment is the "Century" single-phase repulsion induction motor, which has the capacity of starting up any load it will run by merely closing an ordinary d.p. or single pole switch, which can be placed in a convenient position near the console; apart from this important feature, by its construction it is probably the most silent of all alternating-current motors at present available.

R. A. Marples.

London. *September 27th*, 1921.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

The "Lowa" Dimming Switch.

While the "Lowa" switch has been before the public for some time, it has recently been so far remodelled as to be practically a new design. As shown in fig. 1, the interior of type A, it contains two packs of small carbon plates, insulated with mica, and firmly held in a brass frame; tappings are taken off by interleaved brass plates to a row of contact studs on the base, over which a contact arm is moved by a dolly similar in appearance to that of a tumbler switch, but without the spring action of the latter. Thus five steps are obtained between full off and full on. The cover is of brass perforated for ventilation as shown in fig. 2. The new

Fig. 1.—Interior of "Lowa" Switch.

Fig. 2.—The "Lowa" Switch, Type A.

switch is small enough to fit on a 3½ in. block, and is suitable for controlling lamps, fans, small motors, &c., up to 100 watts at any standard voltage. Tested at the National Physical Laboratory, it withstood a pressure of 1,000 volts between the case and the terminals, and varied the current flowing to a lamp from 0.18 to 0.11 ampere at 200 volts; with all the resistance in circuit, the temperature of the cover

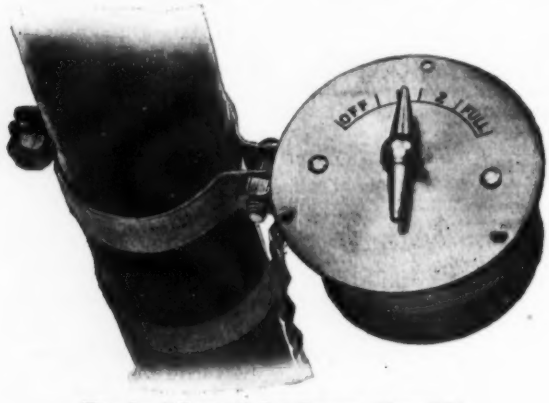


Fig. 3.—"Lowa" Car Switch, Type CC1.

after half-an-hour's run was 30 deg. C. above that of the air. Similar results were obtained at Faraday House.

Other patterns include straight-line sliding types, giving gradations up to 25 steps, and suitable for theatres, kinemas, &c., and a motorcar switch which can be fixed on the dash or, as in fig. 3, mounted on the steering pillar. The last named is useful for dimming the headlights when approaching other vehicles, and for saving current when a car is standing at the kerb; it also serves to protect the lamps from overrunning when they are energised from the magneto.

The sole selling agents are The British & Allied Electrical Agency, Ltd., 13, Charterhouse Street, London, E.C. 1.

The "Airedale" Oil Circuit-breaker.

An automatic oil-break circuit-breaker, suitable for a.c. or d.c. circuits up to 30 amperes at 600 volts, has been introduced and provisionally protected by the Airedale Electrical and Manufacturing Co., Ltd., of 153, Ryan Street, Bowling, Bradford. The principles of the mechanism and the development generally have been very carefully thought out by Mr. L. E. Wood, A.M.I.E.E.; the total weight of the device is only about 28 lb., so that it is easy to handle and can be mounted on any wall or other structure without difficulty. The design is said to embody several novel features, the trip mechanism being very simple and free from the disadvantages of the toggle-joint principle; wear of the moving parts will not impair the positive action of the tripping gear, and the moving contacts are at maximum speed at the moment of leaving the stationary contacts. The no-volt coil and trip are positive in action and unaffected by vibration, and the parts are interchangeable. The switchcase is of cast iron, and the tank of pressed steel, with interlocking gear. The loose handle principle is adopted, and an inverse time element

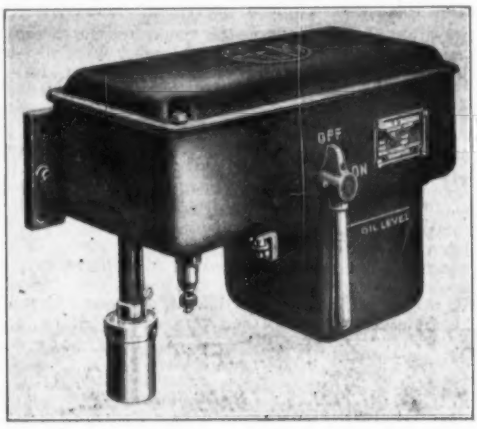


Fig. 4.—"Airedale" Automatic Oil Circuit-breaker.

device is supplied if required. Adjustments are provided for the overload trip and inverse time element device, and an ammeter can be fitted. Fig. 4 shows the external appearance of the breaker.

The "Pride" Patent Bowl, Ring, and Silk Shade Fitting.

The usual practice in connection with indirect lighting by bowl fittings has been to suspend the ring or the bowl itself from a ceiling plate by three chains, and to drop the flexible cord conductors from the centre of the plate, through an insulator or a cord grip, the cord either hanging vertically to the lamp holder or being twisted round one of the chains. A neat device has been invented, and provisionally protected, by Mr. F. H. Pride for concealing and protecting the flexible

Fig. 5.

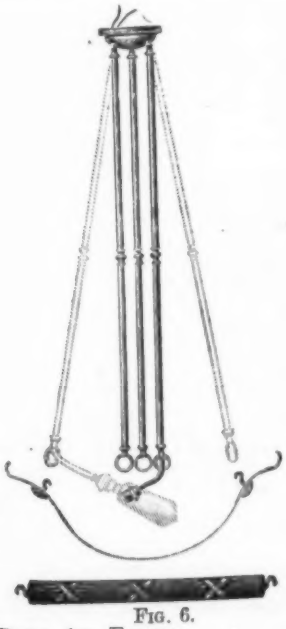


Fig. 6.

The "Pride" Bowl, &c., Fitting.

by means of brass tubes, whilst allowing the fitting to retain full freedom to swing, so that no strain is imposed on the tubes when the bowl is cleaned or when the lamps are being fixed in the holders. As shown in figs. 5 and 6, the ring is suspended by three small tubes, with eyes at the lower ends, which engage with the hooks on the ring or bowl; the tubes

are held to the ceiling plate by half-round ball screws, which allow the tubes to swing freely in any direction, and also enable them to be folded together for packing as shown in fig. 6. At the lower end of one of the tubes a lamp-holder is attached, and the flexible is carried from this through the tube to a connector lodged in the ceiling plate, ready for coupling to the leads. Thus the flexible is completely hidden and protected not only from mechanical damage, but also from damp and dust. The lamp-holder can be adjusted to focus the lamp in the bowl, after which it remains permanently in the correct position; the fitting is suitable for ordinary metallic-filament or gasfilled lamps, and the holder can be fixed at any desired angle. The fitment is independent of the ring or shade, so that an existing stock of these can be used up, or they can be supplied with the fitting; and it is stocked in various lengths, colours, and finishes. Mr. G. Boorman, of 413, Oxford Street, London, W.1, is the sole agent for the device, and we understand that large orders have been placed for it to be installed in the bathrooms of several of the most noted London hotels.

The Grubb Non-Dazzle Motor-car Headlamp.

On the stand of the Engineering & Lighting Equipment Co., Ltd., of Sphere Works, St. Albans, Herts., at the Shipping, Engineering, and Machinery Exhibition was shown the latest pattern of the Grubb non-dazzle headlamp, made by Sir Howard Grubb & Sons, Ltd., St. Albans. This lamp is illustrated herewith in figs. 7 and 8; it consists of a slightly conical tube fitted with two semi-circular lenses at the smaller end, and with a 50-c.p. electric lamp and reflector of the usual type at the larger end. The tube is divided into two compartments, upper and lower, by a horizontal sheet metal partition extending from end to end, and, as shown in fig. 8, part of the reflector is screened off by brass plates of special shape. The tube is carried on trunnions near its centre of gravity (a lighter type for small cars is carried on a pivot).

We are informed that this lamp, while perfectly "non-dazzle" over the desired boundary line (fixed by the French authorities at one metre from the ground), gives practically the same driving light as is attained by the best lamps of the usual dazzle form when using a bulb of the same candle power.

It is a focus lamp, *i.e.*, it is so constructed as to form an image on a distant object of apertures in a diaphragm placed immediately in front of the ellipsoidal reflector, and therefore the outline of the illuminated area can be sharply defined even at the longest distance. The non-dazzle effect is not produced as in other forms by stopping off any portion of the light collected by the reflector, but by using an optical arrangement that utilises practically the whole of the light.

This result is obtained by making the projecting lens in halves, the optical centres of which are separated by a quantity just sufficient to enable the two images to overlap exactly on the distant object. The upper lens forms an inverted image of the space A, fig. 9, and the lower lens an inverted image of the space B overlapped on A, the upper edges exactly coinciding.

Fig. 7.—The Grubb Non-dazzle Lamp.

Fig. 8.—The Grubb Lamp Tube and Diaphragm.

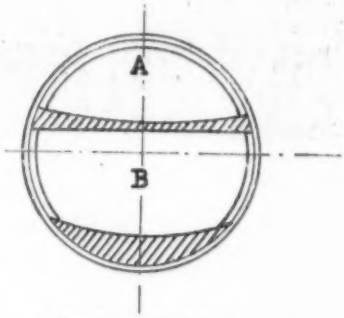


Fig. 9.—Arrangement of Diaphragm.

The only part of the light not utilised is that represented by the hatched portion, a very small percentage of the whole.

The edges of the diaphragm which form the upper edges of the inverted images are made with a slight curve, which gives a similar curve to the upper edge of the projected beam, to coincide with the general camber of the road.

BUSINESS NOTES.

Bankruptcy Proceedings.—G. W. Endall (Endall & Co.), electrical, mechanical, and automobile engineer, Canal Motor Works, Canal Bridge, Church Street, St. Helens.—Receiving order made September 27th on debtor's own petition.

E. Kerfoot, electrical engineer, 103, Cobden Street, Mosley Lane, Blackley, Manchester.—Receiving order made September 26th on creditors' petition.

A. Maskill, electrician, 43, South Avenue, Halfpenny Lane, Pontefract.—Receiving order made September 24th on debtor's own petition. First meeting October 7th at the Official Receiver's office, Wakefield. Public examination November 10th at the Court House, Wakefield.

J. Harrison (Harrison & Son), 93, Princes Street, London Road, Southend-on-Sea.—Last day for proofs for dividend October 15th. Trustee: Mr. T. Gourlay, 29, Russell Square, W.C. 1.

Matthew Watkinson, Harold Watkinson, and Arthur Watkinson, trading as Watt & Co., 22 and 24, Palmer Road, Sheffield, electrical and mechanical engineers. Trustee: Mr. T. C. Parkin, Jr., 36, Bank Street, Sheffield. The following are creditors herein:—

	£		£
British Insulated & Helsby Cables, Ltd.	61	Watkinson, Elizabeth	150
Jack, R. & T.	26	Watkinson, Lilian May	66
Northern Rubber Co.	44	Watkinson, Walter	11
Rowlands, W., Ltd.	410	Watkinson, Annie Ada	60

F. C. Nichols, electrical and mechanical engineer, 19, South Street, Scarborough.—First meeting, October 14th, at the Official Receiver's office, Scarborough; public examination, October 25th, at the Court House, Scarborough.

H. E. Carr, electrical contractor, Reedness, near Goole.—Last day for proofs for dividend November 2nd. Trustee: Mr. C. R. Townend, Carlisle Chambers, Goole, Yorks.

J. Skinner (Foster, Skinner & Co.), electrical fittings dealer, 6, South Castle Street, Liverpool.—Trustee (Mr. E. D. Symond, 11, Dale Street, Liverpool) released August 29th, 1921.

J. C. Thomson, electrician, lately electrical engineer and contractor, Station Street, Mansfield, Notts.—Trustee (Mr. E. W. Humphreys, 4, Castle Place, Nottingham) released August 8th.

W. Drysdale, electrician, Paxton Street, Barrow-in-Furness.—Last day for proofs for dividend October 14th. Trustee: Mr. H. Mossop, 4, Ramsden Square, Barrow-in-Furness.

J. V. Bell, electrical engineer, 21, North Bar Within, Beverley, Yorks.—Last day for proofs for dividend October 19th. Trustee: Mr. E. P. Dutton, Victoria Chambers, Bowl-Alley Lane, Hull.

Company Liquidations.—Spensers, Ltd., Conduit Place, Paddington, London, W.—In pursuance of the provisions of the Companies (Consolidation) Act, a meeting of the creditors was held on September 30th, at the Cannon Street Hotel, E.C., having been called by Mr. F. A. Caddick, of 7a, Laurence Pountney Hill, London, E.C., who had been appointed liquidator. According to the statement of affairs the unsecured liabilities amounted to £20,759, of which £8,646 was due to the trade, and £10,706 was owing to cash creditors. The balance of £1,405 represented the deficiency as regarded the second debenture holders. The assets were estimated to

realise £27,580, from which had to be deducted £1,306 for preferential claims and £11,152 for the first debenture holders. This left assets of £15,121 to meet the claims of the second debenture holders which were £16,526. There were consequently not sufficient assets to fully discharge the claims of the second debenture holders. The assets comprised cash in hand, £697; plant and machinery at book value, £3,000; furniture, fittings and fixtures at book value, £519; stock in trade, loose tools, and work in progress estimated on the basis of a going concern, £16,000; and book debts expected to produce £7,382. No value was placed for the moment on the patent rights. It was pointed out that as the assets were insufficient to fully discharge the claims of the debenture holders there was nothing available for the ordinary unsecured creditors. The issued share capital of the company was £30,000, there having been issued 60,000 ordinary shares of 10s. each which were fully paid. The deficiency as regarded the shareholders was £50,759. The company had been in existence for a number of years, and the shareholders had found substantial sums in cash for the business. In 1919 the shareholders found over £19,000, for which they received shares, and in addition they contributed about £10,000 by way of a gift in order to write off certain leases. Debentures had been issued by instalments since 1912. The last issued was in April, 1920, and amounted to £11,000 for cash. The creditors decided to confirm the voluntary liquidation of the company with Mr. Caddick as the liquidator.

Renew Lamp Co. (Eastern), Ltd.—Winding up voluntarily. Liquidator: Capt. H. D. Carey, 3-4, Great Winchester Street, E.C. A meeting of creditors was called for October 3rd. Particulars of claims should be sent to the liquidator by November 2nd.

Trade Announcements.—The Spearing Boiler Co., Ltd., has removed to larger offices, and its address is now 20, Kingsway, London, W.C. 2. Telephone Nos.: Holborn 5740 and 5741. Telegraphic Address: "Arcturus, Estrand, London."

The J. L. Electric Co., 30, Church Street, Birmingham, informs us that it is now manufacturing its universal wiring clips of aluminium instead of tinned brass. This has rendered possible a considerable reduction in price.

Messrs. Haynes Bros., Ltd., have removed their electrical business from 18, Gabriel's Hill, to King Street, Maidstone.

Mr. A. Walkington, district representative of the Electrical Engineering & Equipment Co., Ltd., of London, has opened a provincial office at Temple Buildings, Pepper Street, Nottingham. Telephone No.: 5295.

Catalogues and Lists.—Messrs. G. S. Peckham & Co., of 4 and 5, New Compton Street, Charing Cross Road, London, W.C.2, have issued a well-bound desk reminder with weekly sheets, each having seven daily spaces for entering engagements or memoranda from now until September, 1922. Readers requiring copies should make application to the firm.

The Rees Roturbo Manufacturing Co., Ltd., Wolverhampton.—Pamphlet R.191 describing the construction of the Rees Roturbo pump, with many illustrations.

Messrs. E. P. Allam & Co., 107-109, Gray's Inn Road, London, W.C.1.—Monthly stock list, No. 12, of electric motors.

The B.E. Co. (of London and Birmingham), Ltd., Hendon House, 57, Upper Thames Street, E.C.4.—Price list of electrical accessories for use with larger catalogue.

Messrs. Higgs Bros., Sand Pits, Birmingham.—"Monthly Magazine," October, 1921, containing priced stock lists of d.c. motors and dynamos and a.c. motors, &c.

Messrs. S. G. Leach & Co., Ltd., 26-30, Artillery Lane, E.C.—A number of booklets and pamphlets illustrating and describing various types of "Arrow" switches and other electrical accessories.

The Thor Electric Safety Lamp Co., Ltd., Thor Works, Rea Street South, Birmingham.—Leaflet M 9/21, dealing with the "Thor" shaft and roadway lamp for mines.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Leaflet O.S. 2520, illustrating and describing the "Huntalite" "candle" lamp. Priced. Leaflet H. 2599, giving prices and illustrations of "Magnet" electric pipe lighters. Also leaflet O.S. 2619, giving an illustration and particulars of the "Oaram" window display for the use of retailers of these lamps.

Messrs. Drake & Gorham Wholesale, Ltd., 67, Long Acre, W.C.2.—Pamphlet No. 316, a comprehensive illustrated price list of electric fires and domestic electrical apparatus; also pamphlet No. 317, dealing with lamps and industrial fittings—illustrated and priced.

Messrs. Edward Le Bas & Co., Dock House, Billiter Street, London, E.C.3.—An illustrated and priced catalogue of a large variety of G.F. malleable tube fittings.

Messrs. Underwood (Manchester), Ltd., 53, Brown Street, Manchester.—An illustrated and priced catalogue of "Moonstone" scientific illumination glassware.

Measurement, Ltd., 34-38, Provost Street, City Road, London, N. 1.—List A, single-phase 2- and 3-wire electricity meters.

Messrs. Donovan & Co., 47, Cornwall Street, Birmingham.—A reprinted catalogue of "Safuse" and "Donlok" switch and fuse gear. Illustrated and priced.

The Efandem Co., Ltd., 22, Newman Street, Oxford Street, W. 1.—A priced and profusely illustrated catalogue of electrical goods, including dry cells, pocket lamps, electric torches, bells, sirens, &c.

The Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester.—Two leaflets dealing very fully with storage battery renewals. Dimensions and weights of a number of different types of plates are given.

Catalogues for China.—The Commercial Counsellor at Shanghai, Mr. H. H. Fox, C.M.G., has notified the Department of Overseas Trade that the majority of United Kingdom manufacturers who communicate with him direct asking for the names of suitable firms to act as agents for the sale of their products in China, do not send with their inquiries catalogues, price lists or illustration of their goods, and even when these are sent the number is usually limited to one or at the most two copies. The Commercial Counsellor points out that considerable delay is frequently incurred on this account, as he has to send a copy of the inquiry with the catalogue round to one firm at a time with a request that, if the business does not interest them, they will return the catalogues. It may also occur that a catalogue gets mislaid when going the rounds in this way. Mr. Fox, therefore suggests that United Kingdom manufacturers, when forwarding him inquiries for agencies, more particularly in the case of engineering specialities, should send at least six copies of their catalogue or illustrations for distribution amongst local firms in China. Attention has recently been drawn by the Commercial Counsellor to the desirability of quoting prices in such publications even if they are only approximate. While United Kingdom manufacturers and traders may, if they wish, communicate directly with His Majesty's Commercial Diplomatic and Consular Officers abroad with regard to any particular item of commercial intelligence upon which they may require information, it is desirable that such inquiries should in the first instance be directed to the Department of Overseas Trade in order to avoid delay in cases in which the Department is already in possession of the required information.

Book Notices.—Circular No. 13 of the U.S. Bureau of Standards, "Standard Specifications for Large Incandescent Electric Lamps (Tungsten and Carbon)." (9th edition.) Washington: Government Printing Office. Price 5 cents.—In addition to the specifications full details are given of the tests to which lamps must be subjected.

"The Faraday House Journal," Vol. IX., No. 4, Michaelmas Term, 1921. Among a great amount of information of interest to students and old students appears a biographical note of the career of Mr. H. W. Swann, A.M.I.E.E., who has recently been appointed an Inspector of Factories. The Principal, Dr. Alexander Russell, contributes an article on "The Capacity between Spherical Conductors."

"Electric Lighting in Factories and Workshops." Pp. 37, 19 figs. London: Sir I. Pitman & Sons. Price 6d. net.

"Diagnosing of Troubles in Electrical Machines." By Miles Walker. Pp. xii+450; 332 figs. London: : Longmans, Green and Co. Price 32s. net.

"Book of the Ford Electrical Equipment." By R. T. Nicholson. Pp. 149; 84 figs. London: Temple Press, Ltd. Price 3s. net.

"The Induction Motor and other Alternating Current Motors." By B. A. Behrend. Second edition, revised and enlarged. Pp. xxiii+272; 204 figs. London: McGraw Hill Publishing Co., Ltd. Price 24s.

"The Thirteenth Annual Report of the Hydro-Electric Power Commission of Ontario—Year ending October 31st, 1920." Vol. I. (326 pp.). Toronto: Clarkson W. James.

"The M. & C. Apprentices' Magazine." Vol. V, No. 19. Autumn, 1921.—A great deal of useful and interesting matter is included in this issue. Among the special articles are one on thermionic valves and an illustrated description of the firm's new iron foundry.

Electric Welding Demonstration.—The Equipment and Engineering Co., of 2 and 3, Norfolk Street, Strand, W.C. 2, is holding a demonstration of electric arc welding on Monday, Tuesday, and Wednesday, next week (October 10th, 11th, and 12th), at the Huddersfield Corporation Tramways Depot (Great Northern Street), by permission of the general manager and engineer, Mr. A. A. Blackburn. The demonstration will include the use of the new E.L. type machine upon the magnetic system which has been specially designed for the rough-and-ready conditions of electric tramway work. Any of our readers who are interested in the matter and wish to attend the demonstration will be welcomed, and they should communicate with the company as above.

Italian Wireless Concessions.—According to the Italian daily Press, the Italian Government intends, in February, 1922, to invite from private firms tenders for concessions for commercial wireless installations between Italy and foreign countries. The competing firms will have to show their technical and financial standing and ability to secure the use of the corresponding station abroad. Italian companies, with capital preponderatingly Italian will be preferred, especially those using Italian-made material and employing Italian labour. The concessions may, however, be given to foreign companies where they prove the possession of superior qualifications.

To Reduce the Cost of Living.—The *Daily Chronicle* reports that Messrs. Dick, Kerr, of Preston, are buying large quantities of American bacon, ham, and tinned goods, and selling these at almost cost price to their workpeople.

Australian Manufactures.—Official reports from Melbourne state that 75 British manufacturing firms have already established solid interests in industrial works and factories throughout Australia, and many more are preparing similar enterprises, notably in Tasmania and Western Australia. This, says the Director of the Federal Bureau of Commerce and Industry, shows that in the opinion of some of the most progressive British manufacturers it pays them to take their plant and their skilled workers to Australia's raw material. The new Australian tariff, he adds, opens up excellent prospects to enterprising firms and affords very real protection.

Chinese Notes.—An electric light plant was imported during 1920 for Linanfu, and a similar plant was expected early in 1921 for Amichow.

Mr. Wang Yu-wen has organised the Lau Ho Kow Electric Light Co. at Lou Ho Kow, Kwangchow.

The Tuchun of Chekiang has recently acquired from the Ministry of War, four sets of wireless apparatus to be installed in Hangshow for military use.

The Tientsin Telephone Adminstration has announced that two branch services have been installed at Yangliutsing and Hengshuiku.

The Self-Government Association of Tungchow has organised a factory to manufacture electric goods.

The Fengtien authorities are reported to have concluded an agreement with the Japanese South-Manchuria Railway Co. for the supply of electricity between Hushun and Mukden.

Sze Shou-tseng, the Director of the Kansu-Haichow Railway, has started a company for the manufacture of electrical machinery in Tientsin. A Belgian has been appointed chief engineer. Official approval has been granted.

During 1920 there were some very heavy importations of machinery. A new plant arrived for the Canton Arsenal in October, and another consignment was for the Kwangtung Electric Supply Co.

The lead ore mine, opened at Siangshui in 1917, failed during the course of 1920. The Chinese company which promoted this enterprise and did all it could to make the mine a success lost, it is said, one-half of the capital invested in the undertaking.

The Provincial Government of Hunan has appointed the Vice-Comptroller of the Mint and the Director of River Likin Posts as members of a commission which plans to establish a copper mining company in Hunan to supply the provincial Mint. All the copper mines in the district of Sinhwa have been alloted to the company for operation.—Chinese Government *Bureau of Economic Information*.

British Syndicate to Take Over Norwegian Works.—The *Oekomisk Review* understands that M. Ragnvald Blakstad, managing director of the A/S Tyssefaldene (The Tysse Falls Share Co.), has transferred his interests in the company to an English syndicate. The company owns a big power station at Odda, Hardanger, which supplies the power for important factories also owned by it.—*Reuter* (Christiania).

"Osram" Window Display.—The General Electric Co., Ltd., has introduced a striking shop-window display for the use of agents for "Osram" lamps. This is composed of a street of miniature houses in accurate perspective, the windows of which are illuminated by means of three "Osram" lamps secreted behind the scenery. The houses are chiefly of the Tudor period, and the colouring is such as to suggest the depth of winter. The "properties" are loaned to agents free of charge and carriage paid for a period of two weeks subject to compliance with certain reasonable requirements. This is an effective device which should meet with a large demand.

E.D.A. Activities.—Among the publications of the British Electrical Development Association referred to in our last issue is a simple but effective poster which bears a representation of a clock dial, a segment of which is shaded. This illustrates an exhortation to use electric light, pointing out that five of every twenty-four hours are spent under artificial light. "Scenes in Suburbia" are discussions between an up-to-date "electrical" housewife and a lady of retarded views upon the superiority of the electrical way of cleaning carpets, resulting, of course, in the conversion of the "non-electrical" housewife. "The Power behind the Worker" is the title of an illustrated booklet describing the electrification of various industrial establishments. A list of the Association's publications, with details of prices, may be obtained from the headquarters: Hampden House, 84, Kingsway, W.C.2.

Italian Railways Electrification: German Plant to be Asked For?—According to a report issued by an Italian news agency, Signor Crova, director-general of the Italian State Railways, has urged the Government to demand electrical plant from Germany on account of reparations in order to expedite the work of electrifying the railways. The agency further states that the schemes of electrification are already prepared for the Venezia Giulia, the Bologna-Verona-Brennero, Pisa-Leghorn, and Naples-Rome lines, while the projects for certain other lines are being studied at present. An interchange of views is now taking place between the Treasury and the General Direction of the State Railways as to the provision of the funds for the construction of the electrical installations and the acquisition of the electric locomotives.

German Prices.—As a result of the growth in the costs of production it is stated that the rebates hitherto granted to merchants on the basis prices of galvanic batteries have been discontinued, and the Foreign Trade Department for Electrical Engineering will only issue export permits in future with the basis prices as the minimum. Makers of pocket lamps have raised the war time addition, which has stood at 250 per cent. until now, to 350 per cent., and the extra percentage on other low-voltage lamps has been advanced from 250 to 300 per cent.

German Export Permits.—For the purpose of providing foreign exchange (bills) for the Reich, the Committee of the Foreign Trade Department for Electrical Engineering has decided that export permits shall only be granted in the future to applicants on condition that they agree to communicate the export figures to the Reichsbank so that the latter may control them, and that the deliveries made are intimated to the latter monthly. A certain percentage of the exchange relating to each foreign transaction is to be handed over, while percentage is to be fixed by the end of October.

The Swedish Telephone Manufacturing Industry.—As reports have been circulated in Swedish newspapers to the effect that the Ericsson General Telephone Co. had discharged a number of workmen, Mr. Hemming Johansson, director of the works, has been interviewed on the question. He is reported to have stated that the work available in the different departments varied considerably. Taken as a whole, no reduction in the personnel had taken place, but only in certain departments. Thus that for the production of large and small exchange installations was fully occupied, but the demand for telephone apparatus was somewhat less at present than in the corresponding period of last year. One manufacture, the production of which had considerably declined, was that of electric meters. Large quantities had been placed in the home market, but sales had now greatly fallen off owing to German competition. On the other hand, there was practically no German rivalry in Sweden in the case of telephone apparatus and exchange installations, whereas American competition was perceptible in certain foreign markets. The number of workmen employed at the Stockholm works, which was 1,285 on June 1st, 1920, amounted to 1,319 on September 16th, 1921. Between the beginning of January and August 1st the total value of the home and foreign sales reached 11,600,000 kr., of which the preponderating part was for export.

At present, Mr. Johansson proceeded to state, the largest amount of business was transacted in Holland and the Dutch Indies, South Africa, Spain and Australia. The great economic development in the Dutch East Indies had resulted in large extensions of the network, the establishment of new telephone exchanges, and the addition of numerous subscribers. Great activity in the telephone system also prevailed in Holland, and the company had received considerable orders for exchange installations and for telephone apparatus, while development was also proceeding in Spain and Egypt, for which large orders were being executed by the Swedish industry. Of the European branches, that at Vienna in particular had a lot of work, and large orders were being carried out there for Czecho-Slovakia, and the works at Budapesth was also in full operation, with a good stock of orders. The English branch, with works at Beeston, attended to the English market and the English colonies, including India. In the opinion of the director, the Indian market was expected to be one of the greatest importance in the near future on account of the economic activity. Already the demand for telephone apparatus, switchboards, &c., was constantly growing. In conclusion, Mr. Johansson expressed the opinion that the prospects for the industry were favourable, having regard to the large demand arising from different sources.

Concessions for Electrical Displays.—The E.D.A. recently made an inquiry with the object of ascertaining the general practice of undertakings with regard to the rates charged for electricity used in electrical displays and showrooms in the hope that it might be found possible in course of time to secure some uniform standard method of treating retail displays of electrical apparatus. There has always been difference of opinion as to whether it pays electricity supply undertakings to offer contractors low rates for supply in order to encourage them to make better displays of electrical apparatus in their windows and showrooms. In some cases such concessions have been abused, but broadly the principle is sound, and it is suggested that all undertakings should consider giving some substantial and uniform discount off their standard rates for all electricity used by contractors and retailers in displaying and demonstrating the use of electrical appliances suitable for connection to the local supply. As a protection, and as a method of preventing other traders from complaining of unfair treatment, it is suggested that it would be possible to assess contractors' display windows and showrooms on the basis of lighting or other uses normal to shops or rooms or like size and character, such assessed normal consumption to be charged for at the rates standard or current for similar businesses, and all excess use over such normal consumption to be charged for at a very low rate. The result of this method would be that the contractor would have the strongest possible encouragement to additional use of the supply in order to make a good display of electrical apparatus and to show it in operation. Out of 145 undertakings replying, 51 notified the existence of such concessions. Of these, 32 reported satisfactory results, while 17 considered justification of concessions doubtful.

Applications for British Trade-marks.—Appended is a summary of the recent applications for British trade marks in respect of goods and productions associated with the electrical trades and industries.

Pinex (lettering and design). No. 417,001. Class 8. Electrical accumulators (not for medical purposes). Chloride Electrical Storage Co., Ltd., Clifton Junction, Manchester 16/7/21.

Aerozon. No. 41,356. Class 11. Electrical fumigating apparatus for hygienic purposes. Aerozonfabrik G. & B. Sternberg, 75, Ritterstrasse, Berlin, Germany. March 18th, 1921.

Aerozonoin. No. 413,562. Class 11. Electrical fumigating apparatus for hygienic purposes. Aerozonfabrik G. & B. Sternburg, 75, Ritterstrasse, Berlin, Germany. March 18th, 1921.

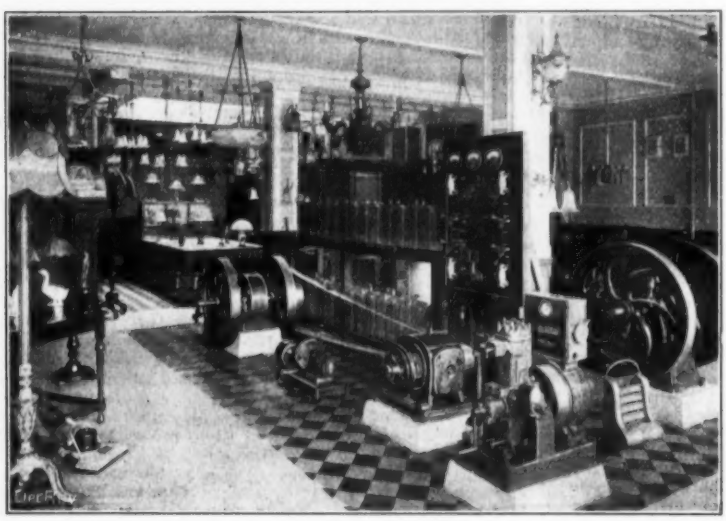
Channel. No. 416,917. Class 13. Sparking plugs. Farringdon Propeller & Engineering Co., Ltd., Eclipse Works, Glentham Road, Barnes, S.W. July 13th, 1921.

Wog. No. 414,417,145. Class 8. Electric accumulators and batteries, not medical. Wm. O. Garbutt, 30, Russell Street, Gloucester. July 21st, 1921.

Bellite. No. 411,234. Class 8. Electric lamps. British Electric Lamps, Ltd., Spencer Hill Road, Wimbledon, London, S.W. January 5th, 1921.

A Recently-opened Showroom.—We reproduce herewith a photograph of the showroom opened a short time ago by Messrs. Mann, Egerton & Co., Ltd., at 173-175, Cleveland Street, W. Here is to be seen a well-arranged comprehensive display of all kinds of electrical fittings and apparatus. In the foreground of the photograph is seen an "Electolite" power set made by Messrs. Boulton & Paul, Ltd., Norwich, for which the firm are sole English agents.

A wide range of lighting fittings appears in the showroom. These are made in a variety of "periods" and styles to conform with any scheme of decoration or furnishing. These fittings include wall brackets, chandeliers, bowl fittings, &c., all of high artistic finish. Other appliances on view in the showroom are pumping sets and battery switchboards, as well as a variety of cables, conduits, lamps, and other electrical accessories.



Messrs. Mann, Egerton & Co.'s Showroom.

The special purpose of this showroom is to enable contractors to bring their clients to inspect the various types of apparatus that are on view, with the full assurance that in any subsequent transactions their interests will be safeguarded, the firm preferring to deal with contractors rather than with the general public.

French Company to Reconstruct Northern Power Stations.—La Société de Reconstitution d'Usines Sinistrées, Groupement Energie Electrique du Nord de la France is the name of a new concern which has lately been formed in Paris (56, Rue du Faubourg St. Honoré), with a capital of 1,000,000 francs with the object of re-constructing the electric generating stations in Northern France damaged or destroyed during the war.

A Finnish Amalgamation.—The shareholders in the Aktiebolag Gottyr, Strombug and the Finska Elektro industri A.B. have resolved to amalgamate under the title of the Finska Elektriska A.B., Gottyr, Strombug, the share capital being 12,300,000 fr. marks. The production is to be concentrated at the works in Sornas and Sockenbacka, the Berghall works of the Elektroindustri Co. being closed.

South African Electrical Trade.—The general managers of the Standard Bank of South Africa in information circulated regarding trade conditions in the Union, report that electrical goods are in poor demand, and prices are easier owing to the arrival of shipments from Great Britain, the Continent, and America. German goods are undercutting British.

Hiring Out Domestic Electrical Apparatus.—The director and secretary of the E.D.A. writes: Although at the present time all supply undertakings possess powers to hire out electrical apparatus there are a great many who are not doing so. It is essential to provide hiring facilities for the more expensive pieces. It would appear that in many undertakings there is hesitation in setting up hiring systems under present circumstances, because the impression exists that it is necessary to commence with a more or less elaborate showroom, a special staff, &c. Supply engineers are asked therefore to consider the possibility of starting the hire of domestic apparatus with a minimum of preliminaries and elaboration, in other words, to get the work going gently. There is little fear that the inauguration of hiring systems will result in a flood of orders and in embarrassment to the supply undertakings; although hiring is essential, much spade work has to be done, and the suggestion is rather that undertakings which have not done any hiring at all should obtain from their authorities a grant or permission to spend a limited sum in the course of six months or a year on the purchase of apparatus for hiring out.

If the matter were approached in this way it might be easy to obtain the necessary permission or grant, whereas proposals for an extensive hiring system might be objected to.

Dowlais Steel Works Reopened.—A rolling mill and railbank at the Dowlais steelworks of Guest, Keen & Nettlefolds, Ltd., have been restarted. Several hundred workmen, long unemployed, resumed work, and according to *The Times*, they were to be increased to 2,000 early this week, in accordance with the proprietors' intention to provide as much work as possible for their workmen, who number altogether about 4,000.

Vagaries of Exchange.—In an interesting article *The Times Trade Supplement* gives the views of Sir Raymond Dennis on the export trade outlook as the result of a 20 months' tour of the world. We quote the following paragraph illustrating the impossible situation that has arisen from exchange conditions:—

"The agent of a well-known American motor car ordered 30 cars for delivery to Rio de Janeiro and settled for them when the exchange rate was 3¼ milreis to the gold dollar. When the cars arrived at Rio the dollar was worth just over 5 milreis, and as the trade position rendered sales at 50 per cent. increase in price extremely remote the agent paid freight and insurance from New York, but left the consignment in the Customs, paying warehousing charges but no duty. The exchange continued to go against Brazil, and at length recognising the hopelessness of the position the agent, after several weeks, reshipped the 30 cars to New York, paid freight, insurance, and other necessary charges, and awaited a credit. When this was remitted exchange had fallen to 8¼ milreis to the dollar, and the agent, after allowing for the freight and insurance both ways, warehousing, and other incidental charges, netted a clear profit of just under £10,000."

Elsewhere in the article Sir Raymond discusses the excessive cost of our productions as being largely the cause of the slump in the export trade which has brought about unemployment. He mentions that in his experience British goods are wanted everywhere, but out prices are too high. Only a few days ago he heard of orders placed by the Federated Malay States in the United States for railway material to the value of £1,000,000, and on the Continent for electrical material to the value of £500,000 because the goods could not be obtained from Great Britain. Other countries were able to give guarantees that we could not give because of unstable wage and delivery conditions.

Lead.—Messrs. James Forster & Co., reporting on October 1st, stated:—"Closing prices yesterday were £23 2s. 6d. for September and £22 17s. 6d. for December, against £22 15s. and £22 12s. 6d. respectively at the end of last week. There has been very little demand from home consumers, and export trade has again been very dull. Should consumption continue at the present level during the next few months, this should be reflected in lower prices for lead.

German Wages and Competition.—"Z." in a letter (dated September 25th) to *The Times*, gives the following figures as to German wages as being of interest when considering German competition. They are figures received from a German factory in the metal trade for the last two weeks: 273 men average 243.45 M. per week; 269 men average 284.05 M. per week. A certain number of lads and a few women are included. The latter figure works out at less than 15s.

Czecho-Slovak-Italian Trade.—Exports from Czecho-Slovakia to Italy in 1920 reached the value of 184,048,160 lire, while the value of imports from Italy amounted to 75,156,013 lire, the trade balance being thus very much in Czecho-Slovakia's favour.—*Reuter's Trade Service* (Prague).

Specification for Metallic Resistance Materials.—The British Engineering Standards Association has just issued Specification No. 115, 1921, for "Metallic Resistance Materials for Electrical Purposes." For the purpose of the Specification these materials have been divided into the following classes: A, for use when a low temperature coefficient is required at temperatures not exceeding 60 deg. C. (as in standard resistances and in sub-standard instruments); B for use when the temperature coefficient may vary more than that permitted for class A, and at temperatures not exceeding 200 deg. C. (as in instruments other than sub-standard); C, for use when the temperature coefficient may vary over a wide range and at temperatures not exceeding 300 deg. C.; D, for use at high temperatures not exceeding 700 deg. C. (as in heating apparatus); and E, for use at high temperatures not exceeding 1,000 deg. C. (as in heating apparatus).

The Specification fixes limits for uniformity of resistance and dimension. A comprehensive list of standard sizes of wires, tapes, and sheets is included, and considerable advantage will result if all designers of apparatus in which resistance wire is used will employ one or other of the standard sizes wherever possible.

Copies of the Specification may be obtained from the secretary, British Engineering Standards Association, 28, Victoria Street, S.W. 1, price 1s. net; post free, 1s. 2d.

Inquiry.—Makers of "asbestos wood" are asked for.

The Commercial Motor Exhibition.—Organised by the Society of Motor Manufacturers and Traders, Ltd., the Commercial Motor Exhibition will be held at Olympia from October 14th to 22nd, and is expected to prove that Great Britain leads the world for the largest display of petrol, steam and electrical vehicles for goods and passenger transport and general utility purposes. The exhibits include such vehicles as road-sweepers, fire engines, ambulances, tipping wagons, &c.

For Sale.—Assets Auctions Co., Ltd., will sell by auction on October 12th, at 119-121, Newington Causeway, S.E., the stocks of an electrical goods factor and a telephone works. By order of Nobel Industries, Ltd. (who are concentrating the cartridge-making business at the Waltham Works), Messrs. Fuller, Horsey, Sons & Cassell will offer by auction at the cartridge works of Eley Bros., Edmonton, on November 8th and following days, surplus plant and machinery, including generating sets, Mirrlees-Diesel oil engines, dynamos, motors, &c. (See our advertisement columns to-day.)

The Premier's Advisers.—Sir Alan Smith, M.P., chairman of the Managing Committee of the Engineering Employers' Federation, and Mr. W. L. Hichens, chairman of Cammell, Laird & Co., Ltd., and vice-chairman of the English Electric Co., Ltd., were among those who went to Gairloch last Friday night to confer with the Prime Minister on measures for reviving trade and industry and diminishing unemployment.

Sir John Dewrance, president of the Engineering and National Employers' Federation (and chairman of Babcock and Wilcox, Ltd.), is also assisting in the Government's deliberations.

New French Companies.—"Over All" Sparking Plug is the title of a company formed at Paris (Avenue du Main 130), for the manufacture and sale in France and Belgium and their colonies of the plug named. The capital is 60,000 fr.

L. Pelletier and L. Baqué have been constituted a company at Hermes (Département Oise), for the construction, installation and repair of electric lines, the working of sub-stations and power stations, and the supply of electric current. The capital is 100,000 fr.

Engineering Developments in Colombia.—The demand for machinery and plant in the Republic of Colombia is slow, but consistent. Improvements in the financial condition of the State, will enable the Government to proceed with a number of projects long contemplated but hitherto impossible owing to the lack of funds.

Engineering commissions have been appointed to report upon the advisability of certain schemes.

Plans have been completed for the erection of a new electric light plant suitable for the growing requirements of the city of Bogotà, while the Municipal Council invites proposals for a new telephone system, the cost of which, including buildings and plant with a capacity of 1,600 lines, should not exceed £15,000. The Government is contemplating the establishment of a long distance inter-urban telephone service to be operated in connection with the telegraph service, which is Government-owned. The principal telegraph offices will be provided with improved equipment, and the work is to be carried out under the supervision of the Director-General de Telegrafos, with whom interested firms can correspond direct. All correspondence should be in Spanish, and addressed to the Director-General, Bogotà (Columbia).—*Reuter's Trade Service* (Bogota).

Belgian Trade Conditions.—The Antwerp correspondent of *The Times Trade Supplement* reports a widespread recovery in almost every trade. Glass works are reopening after months of idleness, and all departments of metal works are busy. Some steel makers are already so full of orders that they are obliged to quote deliveries extending over several months, but for girders and rails quicker deliveries can still be arranged. General engineering shops and electrical works are, however, fully booked for the whole of the winter. Even the automobile industry shows a marked recovery in activity.

LIGHTING AND POWER NOTES.

Accrington.—Loan.—The Corporation has applied to the Electricity Commissioners for power to borrow the necessary money for carrying out the work of supplying Messrs. Steiner & Co., Ltd., with electricity.

Aldershot.—Year's Working.—The report of the electrical engineer (Mr. F. Garside), on the past year's working of the electricity department shows a total revenue of £16,933 as compared with £14,818 in the previous year. Working expenses totalled £16,299, leaving a gross profit of £633. The net result was a deficit of £2,275. The number of units sold was 533,297.

Argentina.—Proposed Hydro-electric Plant.—A French engineering company has solicited a concession from the Republics of Argentina and Uruguay for the construction of a hydro-electric station at the falls of the Uruguay river which separates Uruguay from Argentina. The proposed plant would furnish electric power to all the territory within a radius of 375 miles of Salto Grande, and would include the principal cities and about three-quarters of the population of Argentina. —*Commerce Reports.*

Ascot.—Increased Charges.—The Ascot District Gas and Electricity Co. has applied to the Ministry of Transport for authority to charge 1s. 1d. per unit, with a minimum payment of 16s. 3d. for each winter quarter, and 10s. 10d. for each summer quarter.

Australia.—Sydney.—Although in 1914 the average price per kWh of electricity in Sydney was higher than that of towns in this country of comparable size, in 1920, it compared very favourably with most, the price having fallen from 1.88d. to 1.76d., while in England charges rose. Now increased charges have been sanctioned, and it is calculated that the average revenue per kWh will be 2.05d. in 1922, an increase of only 9 per cent. upon the pre-war average.

Barnstaple.—Loan.—The Town Council has applied for a loan of £1,500, for capital expenditure at the electricity works.

Bath.—Loan Sanctioned.—The Electricity Commissioners have sanctioned the loan of £22,000 for mains and services on account of the £30,000 applied for, but require further particulars concerning the expenditure of the amount forming the balance.

Bo'ness.—Electricity Supply.—The Scottish Central Electric Power Co. is seeking permission from the Grangemouth T.C., to lay a cable to Bo'ness in order to supply electricity from Bonnybridge.

Bristol.—Year's Working.—The annual report on the working of the Corporation electricity department for the year ended March 31st, 1921 (engineer and manager, Mr. H. Faraday Proctor), shows that the revenue increased to £303,930 (£229,525) and the expenditure to £236,409 (£166,590), which left a net profit of £6,864 (£10,875). The number of consumers increased by 1,657 to 8,923; the total connections to the mains are equivalent to 1,263,485 30-watt lamps, an increase of 168,925 lamps as follows:— Power, heating, and cooking 130,114, private lighting 38,755, and public lighting 56 lamps. The number of kWh sold, increased by 4,489,737 to 33,529,417, but the load factor fell from 27.1 to 26.7 per cent. The number of cooking stoves in circuit increased from 84 to 100, the fuel per kWh sold from 3.986 to 4.177 lb., and the total cost from 1.357 to 1.683d.

Chester.—Extensions.—Subject to the consent of the Chester Rural District Council, the Electricity Committee intends to lay a distributing cable in Ermine Road, at an estimated cost of £500.

Electricity Charges.—The Electricity Committee has decided that the increased charge of 1½d. per unit made to meet the increased cost of coal during the coal strike be terminated. A new scale of charges is to be considered when the Queen's Ferry scheme is in operation.

Chesterfield.—Loan Sanctioned.—The Electricity Commissioners have sanctioned the borrowing of £4,000 for electricity mains and services.

China.—Nanking.—Owing to the inability of the existing electric plant at Nanking to furnish sufficient current to meet the needs of the city and its riverside suburb of Hsiakwan, a new plant has recently been added. The United States Consul reports that the plant complete, exclusive of the site, cost about £25,000. It was supplied from the United States.

Continental.—West Finland.—An electricity supply company has been formed under the title of Bjorneborgs-Hvittisbogjard Mellanneids Elektricitats A.B., with a paid up capital of 600,000 Finnish marks. The directors have been authorised to enter into contracts with the Central-Andelslaget-Hankkija, A.B. Gottfried Stromberg, Siemens-Schuckert, and the A.E.G. for electrical plant and the setting of the works in operation.

Russia.—The Electrotechnical Congress in Moscow, the object of which is to extend greatly the use of electric power in Russia, was opened on October 1st.—*Reuter* (Reval).

Dublin.—Electricity Charges.—The Electricity Supply Committee has decided to reduce the electricity charges for heating, cooking, &c., by ½d. a unit. It does not propose to make any alterations in the rates of lighting.

Darwen.—Revised Charges.—The electricity department has revised its minimum charges, fixing 5s. for the quarters ending June 30th and September 30th, and 10s. for the quarters ending December 31st and March 31st, 1922.

Edinburgh.—Area of Supply.—The new Corporation electric station at Portobello is nearing completion, and the questions of the extent of the area to be supplied and the administering authority within the area are to be decided by the Electricity Commissioners. The first instalment of the scheme, which will soon be operating, is to cost £1,750,000. A report circulated by the town clerk suggests that the area should be in the Lothians within a radius of ten miles of the station, as it is likely that the demand for supplies of electricity which can be met by the Corporation will be within such limits, although under the Act bearing on the matter the radius may be as great as 30 miles. The town clerk further submits a strong case for the Corporation being the authority controlling the area for electricity purposes, the alternative of a joint authority, which will have no financial or executive powers, being regarded as likely to lead to friction and difficulties. The only existing authorised distributors within the area are a company at Musselburgh and one at Dalkeith. These will receive electricity in bulk from the Corporation and pass it to their consumers. The report, which also suggests that the application by the Musselburgh company to extend the area of its supply should be opposed as unnecessary, has been generally approved by the Corporation committee concerned.

Gourock.—Street Lighting.—The Town Council has entered into negotiations with the Greenock Electricity Committee for the electric lighting of Gourock.

Greenock.—Strike Averted.—A threatened strike of the technical staff of the electricity undertaking was averted on Friday last when the Corporation electricity department considered a dispute over a proposed wages cut, and heard Mr. J. W. Thomas, assistant general secretary of the E.P.E.A., on behalf of the staff. It was intimated that the proposed reductions would not take effect in the meantime, and that the whole question would be reconsidered by the Corporation.

Guildford.—Electricity Works Bought.—The Urban District Council has taken over the electricity works from the Guildford Electricity Supply Co., Ltd., at a cost of £60,000.

Hessle.—Electricity Supply.—A draft agreement made by the Urban District Council with regard to the supply of electricity to the town has been submitted to the Hull Corporation Electricity Committee.

Llandrindod Wells.—Proposed Increased Charges.—An inquiry was held by the Ministry of Transport last week relative to the application of the Electric Light & Power Co. for an order authorising it to increase the price of electricity to 1s. 4d. per unit. The Urban Council and a number of large consumers opposed the application.

London.—Ilford.—The Ministry of Health has refused the request of the Urban Council for permission to install electricity in the new London County Council houses on the Dagenham estate, on the ground of the expense involved.

Luton.—Increased Charges.—The Town Council has increased the charge for electricity to 125 per cent. above the pre-war price in place of the 100 per cent. addition which has previously been charged.

Maidstone.—The Town Council has applied to the Commissioners and also to the Kent Electric Power Co. for permission to supply electricity to the mill of A. E. Reed & Co., Newhythe, which is outside the Corporation's area of supply. The Council has also applied for a further loan of £500 for the purchase of apparatus in connection with the hiring out of fires, irons, and cooking stoves.

Nottingham.—Mains Extensions.—The Electricity Committee recommends the expenditure of £40,000 for general extension of mains, transformers, and switchgear in connection with the high-pressure mains already laid and for increasing the area of two feeders supplying certain districts of the city. The whole of the capital sum of £30,000 sanctioned by the Council in December last has been laid out upon underground mains and outside service connections. In the purchase of meters during the year ending March last £7,735 was also spent out of revenue, but the committee being of opinion that such meters should be purchased out of capital, intimates that for this purpose a sum of £10,000 is required. It has been recommended, therefore, that authority should be given to apply to the Electricity Commissioners for leave to borrow £50,000. Considerable satisfaction is being expressed in Nottingham with the substantial progress which is now being made in many departments of the committee's work, after periods of long delay.

Portstewart (Co. Londonderry).—Power Station Development.—The Electric Lighting Co. has decided to ask consumers to guarantee additional capital for the development of the undertaking. Application has been made to the Northern Ireland Parliament for new powers.

Portslade.—Reduced Charges.—Brighton Town Council has reduced the charge for electricity for private lighting at Portslade from 8d. to 7½d. per unit.

Rathmines and Pembroke (Co. Dublin).—Linking-up.—The electrical engineers of both towns have been instructed to submit a joint report on the linking-up of the two electricity supply systems, and proposals for a 1,000-kW set, and bulk supply from a neutral source.

Singapore.—Electricity Extensions.—The municipality is extending its supply of electricity to the European residential quarter of the town. Work is now in hand, and energy is expected to be available early in the spring. This has naturally affected the sale of self-contained lighting sets hitherto so popular there.—*Reuter's Trade Service* (Singapore).

Skipton.—Bulk Supply.—The Streets and Buildings Committee has under consideration a proposal for the supply of electricity in bulk from the Keighley undertaking, and has asked the electrical engineers of both Corporations to prepare details and submit them to the Committee in due course.

Electric Lighting Order.—The Electricity Commissioners have fixed the date for the operation of the Electric Lighting Order, 1915, for September 1st.

Warrington.—Lighting Order.—The Electricity Commissioners fixed last Saturday (October 1st) as the date for the commencement of the operation of the Lighting Extension Order of 1915.

Wye (Kent).—Electricity Supply.—The Commissioners have made a special order authorising the Wye Lighting, Heating and Power Co., Ltd., to supply electricity for public or private purposes within the parish.

TRAMWAY AND RAILWAY NOTES.

Australia.—Victoria.—The present position regarding the scheme for the electrification of the Victorian railways is summarised in a report recently issued in Melbourne. It comprises a power house, high-pressure feeder cables, 16 substations, 145 miles of track with overhead wiring and rail bonding, the conversion of 702 carriages, replacement of a large portion of the existing signalling system, and construction of workshops. Up to the present the total value of the actual expenditure upon the several activities of the commission amounts to nearly £550,000.

Bradford.—Year's Working.—The financial report, issued by Mr. R. H. Wilkinson, the general manager of the Corporation tramway undertaking, shows a loss of £4,000 on the parcel department for the past year. The gross revenue was £19,420. The number of parcels carried was 740,699, as against 713,073 in the previous year. The deficit is attributed largely to the wages bill for parcel messengers.

Continental. — Switzerland. — According to *The Times*, £2,280,000 is to be spent on the electrification of the Swiss railways next year.

The French Southern Railway.—The report for 1920 of the Compagnie des Chemins de Fer du Midi states that the work of electrification of the network, the resumption of which was announced in the report for 1919, was actively continued during the year. The station in the Ossau valley, and the erection of the power transmission lines from the district of the Pyrenees to Bordeaux and Toulouse are in full course of execution; the equipment works of the lines from Toulouse to Puyoo and from Puyoo to Dax, which are the first to be converted, have been put in hand, and the electric locomotives for these lines have been ordered. If the contract periods are observed, as is reasonably hoped for, the inauguration of electrical working on the section between Toulouse and Dax will take place from 15 to 20 months hence.

Dearne Valley.—Light Railway.—According to the *Financial Times*, preparations are being made for the construction of the Dearne Valley Light Railway, the necessary powers having been conceded. Contracts are being prepared and various preliminary negotiations conducted, notably in connection with road widenings.

Halifax.—Depot Extensions.—The Tramways Committee has decided to recommend that the Skircoat Road depot be extended, at an estimated cost of £11,000, to furnish four times the present accommodation for repairing cars and an enlarged workshop.

Japan. — Electrification of Railways Scheme. — The Japanese railways are to be electrified according to a plan now being worked out by the Department of Railways, states the *Journal* of the Yokohama Chamber of Commerce. As soon as the Department draft plan is completed, it will be presented through the Cabinet to the Diet in its next session. To facilitate the service, automatic signals have been installed. As the first step, the entire Tokaido line from Tokio to Kobé and a part of the central line between Iidamachi station in Tokio and Kofu, in the rear of Mount Juji, where many tunnels make transportation slow, will have electric power installed.—*Board of Trade Journal.*

Keighley.—Year's Working.—The annual statement of accounts of the Corporation Tramways Department for the year ended March 31st, 1921, shows a loss of £3,400, and the railless car system, which has not yet recovered from the heavy setback received during the war, shows a loss of £5,320. It is understood that much of the heavy expense is attributed to the cost of rewinding armatures. In the previous year there was a surplus of £1,675.

London.—Underground Railway Improvements.—In order to meet the demand during rush hours, 153 additional cars have been brought into service on the Metropolitan and District Railways, and through Southend trains are to be reinstated.

There will be a more frequent service on the Tube lines. On the Bakerloo branch trains will run every 2 and 2½ minutes instead of 2½ and 3 minutes. Similar shortening of the train intervals will be made on the Hampstead, Central London, and City & South London lines.

Report on Collision.—In a report upon the collision which took place on July 8th at Wapping, between a Great Eastern Railway goods train and a Metropolitan Railway passenger train, Col. J. W. Pringle states that the accident was caused by the breaking of a draw-bar hook on one of the goods wagons. This released five trucks which apparently ran back into the front of the passenger train. There was no evidence of any flaw in the metal of which the hook was made. In his recommendations Col. Pringle says that the number of unfitted trains should be limited as far as possible during the hours of passenger service, especially on a line having such gradients as the one in question. There is another point for consideration. The track circuit (A) on the up road through Wapping station is continued beyond the up starting signal for a distance of 166 yards to form an overlap. In advance of A there is a track circuit B, occupation of which places and holds at danger the starting signal. So long as the five runaway vehicles occupied the rails covered by track B, the starting signal at Wapping was held at danger. But as soon as they left track B and entered track A the starting signal would automatically clear. This accounts for the fact that the starting signal indicated safety, and the up electric train had consequently started when the runaway vehicles were approaching. This false clear indication can, of course, only be given in similar circumstances, *i.e.*, by vehicles running backward, but the irregular position of the signal in such circumstances is a further reason for the provision of additional security against breakaways.

Madagascar.—Railway Electrification.—The *Exportateur Francais* says plans have been drafted at the instance of the Governor-General for the electrification of the Tananariva to Tamatava railway in Madagascar, a distance of 369 km. The reasons for the conversion are high wages and the cost of coal.

Oldham.—Year's Working.—The annual report of the general manager and engineer, Mr. W. Chamberlain, on the year's operation of the Corporation tramways for the twelve months ended March 25th, 1921 (twentieth year of operation), shows that the total receipts amounted to £250,742, against £237,409 for the previous year; the working expenses were £202,235 (£168,648), leaving a net profit of £5,065, against a deficiency of £1,004 last year. The electricity used for all purposes amounted to 4,225,055 kWh (3,921,931) at 1¼d. and 1½d. per kWh, plus 10 per cent., the average kWh per car mile being 1.918. The number of passengers carried was 32,071,037 (31,878,455); average per car mile 14.559; average fare 1,819d. Statistics of the parcel department show that the expenditure was £2,662 (£2,346), and the income was £2,402 (£2,341), the balance being a deficit of £260 (£5), although the rates were increased during the year.

Preston.—Year's Working.—For the first time in the history of the undertaking the report and statement of accounts of the county borough's tramway department, for the year ended March 31st, 1921, disclose a deficit on the year's operations. The total revenue increased by 8.04 per cent. to £96,482, and the working expenses by 29.73 per cent. to £85,458, the deficiency being £6,806. Total reserves stand at £51,706, sinking fund at £89,709, and the old tramway debt at £20,701; contributions to the rates have amounted to £23,050. The number of passengers carried was 15,885,352 (15,738,087) at an average fare of 1.44d. (1.34d.) per passenger. Electricity generated amounted to 1,946,945 kWh (1,788,495,, the power cost per kWh being 1.28d. (0.993d.). The working expenses per car mile were 16.95d. (13.62d.), and Mr. J. F. Simpson, engineer and manager, states that the fact that out of 71 municipal tramway undertakings there are only four with lower working expenses per car mile than Preston would apparently indicate that they cannot make much progress in that direction, and it has therefore been necessary to adopt the alternative and to increase the fares. This increase came into operation in November, 1920, and the results have so far been quite satisfactory; if the increase in total receipts is maintained at the same level for the remainder of the year he anticipates that they will at any rate cover the expenses.

Walthamstow.—Proposed Transfer.—According to *The Times*, as the tramway system has been a heavy debt and the increased fares have not helped the financial position, the London County Council is to be invited to take it over and work it.

Warrington.—Tramway Extensions.—The Electricity and Tramways Committee has under consideration a scheme for laying a tramway track between Warrington power station and along Mersey, Napier, and Parr Streets.

York.—Tramwaymen's Bonus.—The Tramways Committee has approved the application of the drivers and conductors of the City tramways that they should be paid full bonus during the period they were working on short time owing to the coal strike.

TELEGRAPH AND TELEPHONE NOTES.

Australia.—Equipment for Radio Stations.—The Australian Navy Department has accepted a Melbourne tender for the supply of high-pressure apparatus, generator sets, and other equipment for the Commonwealth radio stations at Perth and Sydney. The price was £9,983 3s. 9d.—*Reuter's Trade Service* (Melbourne).

An Italian Marconi Co.—A new company has been formed at Leghorn under the title of the Italian Marconi Co., all the share capital being Italian. The object is to establish and work radio stations for public services in Italy, the Colonies, and countries under Italian influence.

Cables in the Dutch East Indies.—The laying of new cables in the East Indian Archipelago, which were supplied by a German company, as was mentioned in a recent issue, is reported to have been completed on September 7th. A length of 1,100 kilometres, it is stated, was laid at a depth of from 3,000 to 5,000 metres, and about 4,000 kilometres at a depth of from 300 to 1,000 metres. Apart from the work done by the cable steamer *Telegraaf*, most of the laying was carried out by the German company by means of a steamer chartered in Norway and specially equipped for the work. [Probably the lengths stated in "kilometres" should read "metres."]

Canada.—According to *The Times*, during one of the worst storms experienced for many years at Ontario and Quebec, the electric and telephone systems were disorganised. In Ottawa alone 800 telephones were cut off.

China.—Shanghai.—According to the *Central News*, preliminary arrangements have been completed by the Federal Telegraph Co., of San Francisco, for the erection of the largest wireless station in the world, capable of sending and receiving messages to and from all over the world.

Continental.—Italy.—Wireless communication between Rome and Tripoli was successfully inaugurated on September 6th.

At the instance of the Ministry of Posts, Telegraphs and Public Works, a Royal Commission of experts has been nominated to study the best means and most suitable scheme for crossing the Straits of Messina with telegraph and telephone lines and power mains. The problem is no ordinary one owing to the straits being within the volcanic earthquake area of this part of Italy.

G.P.O. Research.—The research work in connection with the engineering department of the General Post Office will in future be done at Dollis Hill, says the *Evening News*. Disused army huts have been erected on a site that was acquired before the war, and later a permanent building will be erected. Hitherto the staff has been scattered in various G.P.O. buildings; concentration at one place, thinks Sir W. Noble, the chief engineer, will make for economy and efficiency. The wireless branch of the department will remain at St. Martin's-le-Grand.

Imperial Wireless Chain.—H.M.S. "Raleigh" has arrived at St. Johns (N.F.). It is understood that the purpose of the visit is an inspection of the Admiralty wireless station with a view to its utilisation as a link in the Imperial wireless chain.—*Reuter's Trade Service* (St. Johns, N.F.).

India.—Bombay Telephone System.—The Bombay Telephone Co. proposes to install an automatic system within three years. The scheme provides for fifteen thousand lines, and the cost is estimated at £400,000, providing for the introduction of a full automatic plant. It appears that the Government of India is prepared to extend the licence of the Telephone Co. for 20 years in the event of the company introducing an automatic or a modern central battery system.—*Reuter's Trade Service* (Bombay).

New Japan-America Cable.—In order to improve the connection between Japan and America, a new submarine cable is to be laid down. It was first intended that it should run from Yokohama via the Alentian Isles to Vancouver and Seattle, but this scheme had to be abandoned owing to the ice risks. The route now suggested is from Japan to San Francisco *via* Bonin Islands, Ladrone Group, Guam, Midway

and Honolulu. It will be largely supported by cables already existing. This route may be shortened by laying a new cable from Bonin to Midway, a distance of 2,923 miles.—*Economic Review.*

New Spanish Cables.—A Royal order published in the official *Gaceta de Madrid* of September 27th authorises the grant of a supplementary credit of two million pesetas to be added to the present estimates for expenses incurred under the heading of "new cables." This additional sum will be applied to the expenses entailed in the laying of a new cable from Malaga to Melilla.—*Reuter.*

Sweden.—Stockholm.—The laying of the large new telephone and telegraph cable between Sweden and Germany was accomplished on September 29th last. One cable steamer has arrived at Zarintzin, to the north of Stralsund.—*Daily Telegraph.*

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Ashford (Kent).—October 12th. East Ashford Board of Guardians. Electric lighting installation at the Workhouse.—Mr. J. Kingsford, clerk, 7, Bank Street, Ashford.

Argentina.—October 21st. State Railways. Twelve months' supply of electrical stores.*

November. State Railways. One year's supply of railway signal material, including telephone and telegraph materials, &c.*

Australia.—Melbourne.—Victorian Government Railways. October 26th. D.c. arc welding plant (Cont. No. 34,377). November 9th. Armature banding machine with electric motor and starting gear (Cont. 34,378).

November 2nd. Electric storage battery complete for automatic telephone exchange (Cont. 34,229).*

January 4th. Victorian Government Railways. 150 electric train stops operated by a single-phase induction motor. One set of electric pyrometer equipment for measuring temperatures of 350 to 2,000 degrees Fahrenheit.—*Reuter's Trade Service* (Melbourne).

Belgium.—October 17th. Municipal Authorities of Schaerbeek, Brussels. 8,000 metres of 3 by 70 by 50 armoured cable and 6,000 metres of the 3 by 50 by 35 ditto. Particulars from the Service de l'Eléctricité, Hôtel Communale. Tenders to the Administration Communale, Schaerbeek, Brussels.

Note.—These are apparently 3-core cables for a 3-wire system.

Colne.—October 11th. Electricity and Tramways Department. Natural draught cooling tower. (September 30th.)

Edinburgh.—October 10th. Corporation. Electric lighting installation at the city collector's offices, Waterloo Place. Engineer's office, Dewar Place.

October 10th. Tramways Department. Sixteen car bodies. Tramways manager, 2, St. James Square, Edinburgh.

October 18th. Electricity Supply Department. Four 10-15-ton hand-operated overhead travelling cranes, electric and steam-driven feed pumps. (See this issue.)

India.—Calcutta.—November 9th. Calcutta Electric Supply Corporation, Ltd. One 15,000-kW turbo-alternator and condensing plant. Two water-tube boilers with an evaporation of 60,000 lb. per hour. (See this issue.)

October 19th.—East Indian Railway Co. Insulated cables. (See this issue.)

Leeds.—October 11th. Health Committee. Electric lighting set, comprising 4 b.h.p. oil engine, 3-kW d.c. generator, and accumulators, complete with tanks, piping, switchboard, &c., at Sanatorium, Gateforth, near Selby. Specifications from R. E. Fox, town clerk, 26, Great George Street, Leeds.

London.—L.C.C.—October 24th. Electric goods lift (capacity 30 cwt.) at the Stamford Hill Stores Depôt. (See this issue.)

Loughborough.—October 31sf. Electricity Department. Steam-raising plant, h.p. and l.p. mains networks. (September 23rd.)

New Zealand.—Wellington.—November 29th. Public Works Tender Board, Mangahao power scheme. Water wheels, generators, 3-unit exciters, transformers, 110,000-V insulators, lightning arresters, switchboard, switches, and accessories. (September 23rd.)

November 21st. Post and Telegraph Department. 750 red and 750 white switchboard cords, 3 conductor (spec. No. 87).*

Portrush.—October 8th. Urban District Council. Work in connection with the public electric lighting of the district. (September 30th.)

Salisbury.—October 10th. Town Council. Electric wiring and fitting for 20 houses.—City engineer.

St. Annes-on-Sea.—Electricity Department. Four miles (approx.) armoured cable. (September 30th.)

South Africa.—Johannesburg.—November 7th. Rand Water Board. Two 350-kW steam-driven electrical generating sets, complete with switchboards and all accessories.*

Humansdorp, Cape Province. November 30th. Corporation. One water turbine and dynamo, switchboard with connections, battery of accumulators, and accessories, supply main and public lighting, aerial distributing lines, street lamps, fittings and accessories, section boxes, service cut-outs, meters, &c., ferro-concrete pipe line, reinforced concrete tank, buildings, and foundations. Forms, &c. (63s.) from the town clerk, Humansdorp, Cape Province.

* A copy of the specification, &c., can be consulted at the Department of Overseas Trade, 35, Old Queen Street, S.W.1.

CLOSED.

Australia.—Victorian Electricity Commissioners.

Switchgear, &c., for Newport "B" power station, four 50 cycle and four 25 cycle feeders, £40,000.—English Electric Co., Ltd.
Step-up unit and station transformer, £21,250.—Metropolitan-Vickers Electrical Co., Ltd.
Seven squirrel cage induction motors, £730.—Gardner, Waern & Co.

New South Wales.—Public Works Department.

Hydro-electric plant for Dorrigo Shire Council, £3,245.—Sir W. G. Armstrong, Whitworth & Co., Ltd.—*Tenders.*

Chester.—Electricity Committee. Accepted:—

Sub-station in Sealand Road.—Wm. Vernon & Sons, Ltd., £1,715.

Government Contracts.—The following contracts were placed during August:—

Admiralty (Contract and Purchase Department).

Aluminium.—British Aluminium Co., Ltd.
Conduit tubing and accessories.—Barton & Sons, Ltd.; I. Birch & Sons, Ltd.; Brotherton, Ediswan Tubes & Conduits, Ltd.; Credenda Conduits Co., Ltd.; General Electric Co., Ltd.; Perfecta Seamless Steel Tube Conduit Co., Ltd.
Electric welding scheme.—Brush Electrical Engineering Co., Ltd.; British Thomson-Houston Co., Ltd.
Electric fuses.—L. Weekes, Ltd.
Electric lighting installation.—Macintosh Cable Co., Ltd.
Motor-driven planing machine.—Scriven & Co., Ltd.
10-ton electric traveller.—Cowans Sheldon & Co.
One 3-ton and one 10-ton ditto.—Sir W. Arrol & Co., Ltd.

War Office.

Electric cells.—Siemens Bros., Ltd.; General Electric Co., Ltd.

Air Ministry.

Accumulators.—Chloride Electrical Storage Co., Ltd.
Battery booster.—Lancashire Dynamo Co., Ltd.
Electrical wiring.—F. G. Minter.
Extension to switchboard.—Ferguson, Pailin, Ltd.
Wireless valves.—General Electric Co., Ltd.

Post Office.

Telephone apparatus.—Automatic Telephone Manufacturing Co., Ltd.; Peel-Conner Telephone Works, Ltd.; Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Telegraph and telephone cable.—Enfield-Ediswan Cable Works, Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.
Joint box castings.—McDowall, Steven & Co., Ltd.
Secondary cells.—Pritchet & Gold & E.P.S. Co, Ltd.
Ducts.—Albion Clay Co., Ltd.; Donington Sanitary Pipe & Fire Brick Co., Ltd.; Doulton & Co., Ltd.
Electric light fittings.—Engineering & Lighting Equipment Co., Ltd.
Tungsten lamps.—British Thomson-Houston Co., Ltd.; Edison Swan Electric Co., Ltd.; English Electric & Siemens Supplies, Ltd.; General Electric Co., Ltd.
Electric motors.—B. K. B. Electric Motors, Ltd.
W.I. pipes.—J. Spencer & Co.
Distribution cable plugs.—British Insulated & Helsby Cables, Ltd.
Bronze wire.—Elliott's Metal Co., Ltd.
Enamelled and silk-covered copper wire.—Connolly's (Blackley), Ltd.
Copper wire (soft strand).—Enfield-Ediswan Cable Works, Ltd.; H. W. Smith & Sons, Ltd.
Laying conduits.—Openshaw-Clayton: Whittaker Ellis, Ltd. Bristol (Central South): Whittaker Ellis, Ltd. Kensal Road: J. Mowlem & Co., Ltd. Stockbridge-Oughtibridge: Hodge Bros. (Contractors), Ltd. Birmingham (South): Hodge Bros. (Contractors), Ltd. Tiverton: G. Percy Trentham, Ltd. Hebburn and Jarrow: G. Percy Trentham, Ltd. Stanmore-Chesham (Section III): G. Percy Trentham, Ltd. Manchester High Street (Section II): W. Pollitt & Co., Ltd.
L.p. switchgear, cables, connections, &c.—P.O. Savings Bank Sub-station: General Electric Co., Ltd.
Manufacture, supply, drawing-in, and jointing cable.—Purley-New Oxted: W. T. Henley's Telegraph Works Co., Ltd.. Portsmouth-Ryde: W. T. Henley's Telegraph Works Co., Ltd. Portsmouth-Sheffield: Callender's Cable & Construction Co., Ltd. Manchester-Hyde-Glossop: W. T. Glover & Co., Ltd.
Motor generators.—Post Office Savings Bank Sub-station: British Thomson-Houston Co., Ltd.
Power plant.—Guildford telephonic repeater station:: General Electric Co., Ltd.
Telephone exchange equipment.—Swansea: Siemens Bros. & Co., Ltd. Sub-contractors for batteries: Pritchett & Gold & E.P.S., Ltd.; for charging machines: English Electric Co., Ltd.; for ringing machines: Crompton & Co., Ltd. Sketty: Siemens Bros. & Co., Ltd. Sub-contractors for batteries: Pritchett & Gold & E.P.S., Ltd.; for charging machine: English Electric Co., Ltd.; for ringing dynamotors: Small Electric Motors Co., Ltd. Ilford: Peel-Conner Telephone Works, Ltd.

CROWN AGENTS FOR THE COLONIES.

Bridge meggers.—General Electric Co., Ltd.
Cable, &c.—W. T. Henley's Telegraph Works Co., Ltd.
Copper line wire.—Elliott's Metal Co., Ltd.
Electrical materials.—British Thomson-Houston Co., Ltd.
Electric meters.—Landis & Gyr, Ltd.
Electrically-driven transporters.—Sir W. Arrol & Co., Ltd.
Lifts.—General Electric Co., Ltd.
Telephone (spare parts).—Siemens Bros. & Co., Ltd.
Train lighting spares.—J. Stone & Co., Ltd.
Wireless apparatus.—Marconi's Wireless Telegraph Co., Ltd.

HIGH COMMISSIONER FOR INDIA.

Generator set.—Lancashire Dynamo & Motor Co., Ltd.
Insulator cups.—Taylor, Tunnicliff & Co., Ltd.
Receivers.—Elliott Bros. (London), Ltd.
Switches, &c.—R. White & Son.
Telegraph apparatus.—Marconi's Wireless Telegraph Co., Ltd.; Automatic Telegraph Manufacturing Co., Ltd.

H.M. OFFICE OF WORKS (JULY CONTRACTS).

Engineering services.—Electric lighting plant: R. A. Lister & Co., Ltd. Kew Insurance Office, electric wiring: Tredegars, Ltd. Llantrissant housing schemes, electric wiring: Alpha Manufacturing Co., Ltd. Rowley Regis housing scheme, electric wiring: T. R. Priest.

PUBLIC WORKS DEPARTMENT, DUBLIN.

Electrical work and supplies, Belfast.—A. Stevenson.

Manchester.—Tramways Committee.

Tramcar trucks.—Brush Electrical Engineering Co., Ltd.

Electricity Committee.

Cable.—Connolly's (Blackley), Ltd.
L.p. water, steam, drain and by-pass pipework, supports, &c., at Barton Power station.—Aiton & Co., Ltd.
L.p. valves for circulating water.—J. Blakeborough & Son.
One transformer oil tank.—St. George's Engineering, Ltd.

Salford.—Education Committee.

Installation of electric light at Wellington Street Council school, £112.—R. Over.

Tramways Committee.

Welding and retreading 500 joints on the tramway track. £675.—Rail Welding Co., Ltd.
Three months' supply of the following stores, &c.:—
Cables and lamps.—Power & Lighting Supplies Co., Ltd.
Cables and tapes.—L. Andrew & Co.
Armature coils.—Barratt & Thornton; Manchester Armature Repair Co., Ltd.
Field coils.—Metropolitan-Vickers Electrical Co., Ltd.; Armature Winding Co.
P. and B. tape and lamps.—British Insulated & Helsby Cables, Ltd.
Insulating varnish.—Griffiths Bros. & Co. (London), Ltd.
Carbon brushes.—J. Eades.
Dry cells.—English Electric & Siemens Supplies, Ltd.
Gear wheels.—British Hele-Shaw Patent Clutch Co., Ltd.

Electricity Committee.

Repair parts for the No. 2 turbo-alternator, £3,370.—Metropolitan-Vickers Electrical Co., Ltd.
Spare armature for the canal water pumping plant.—Mather & Platt, Ltd.
Switch tripping batteries for the Blackfriars and Trafford sub-station, £276.—Metropolitan-Vickers Electrical Co., Ltd.
250 yards 3-in. stoneware pipes and 500 yards 3½-in. stoneware pipes, £211.—Doulton & Co., Ltd.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday, October 7th, at the Caxton Hall, Westminster, S.W. At 8 p.m. Lecture on "Colour Vision and Colour Blindness," by Dr. E. Green.
Friday, October 14th, at Caxton Hall, Westminster. At 8 p.m. Paper on "Electric Cranes," by Mr. C. H. Woodfield.

Association of Engineers in Charge.—Saturday, October 8th, at the Holborn Restaurant. At 6 p.m. Annual dinner.

Birmingham and District Electric Club.—Saturday, October 8th. At the Grand Hotel, Colmore Row, Birmingham. At 7 p.m. Paper on "Commercial Efficiency of the Telephone," by Mr. C. G. Findlay.

Institute of Transport.—Monday, October 10th. At the Hotel Cecil. At 7.30 p.m. Annual dinner.

Institution of Electrical Engineers.—EAST MIDLAND SUB-CENTRE.—Tuesday, October 11th. At the College, Loughborough. At 6.45 p.m. Address on "Modern Development in the Electric Supply Industry," by Mr. T. P. Wilmshurst, chairman.

Northampton Engineering College Engineering Society.—Wednesday, October 12th. At 5.30 p.m. Paper on the "Construction of the Curtis Turbo-Alternator," by Mr. A. L. M. Ayres (kinematograph).—At 6.30 p.m., Presidential address, by Dr. R. Mullineux Walmsley.

Commercial Motor Exhibition.—Friday, October 14th, to Saturday, October 22nd. At Olympia, W.

Edinburgh Electrical Society.—Friday, October 14th. At the Philosophical Institute. At 8 p.m. Paper on "Electro-Chemistry," by Mr. R. W. J. Stark.

Electro-Harmonic Society.—Friday, October 14th. At the Grand Hall, Cannon Street Hotel, E.C. At 8 p.m. First smoking concert of the 1921-1922 season.

NOTES.

The Electro-Harmonic Society.—The first smoking concert of the 1921-22 season will be held in the Great Hall, Cannon Street Hotel, E.C., on Friday, October 14th, commencing at 8 p.m. The following is the list of artistes:—Miss Doris Vane, soprano; Mr. Walter Glynne, tenor; Mr. Charles Tree, bass; Mr. Middleton Woods, stories; Mr. Herbert Collings, magic; Mr. Norman Long, humour at piano; Mr. Bernard Flanders, A.R.A.M., solo pianist and accompanist.

Appointments Vacant.—Works superintendent (£390), for the Oldham Corporation Tramways; Engineering assistant (£564), for the Stoke-on-Trent Corporation Electricity Department. See our advt. pages today.

The Electrical Trades Benevolent Institution.—Sir Tom Callender, who is presiding at the annual festival (to be held on October 26th) has issued an appeal for support to the Institution, in which he points out that its primary object is to grant pensions to those of its members who may fall on evil days, the funds for this purpose being provided out of income from its investments. As this is only £650 per annum, it will be recognised that the amount available for distribution is very limited.

In addition to this, the Institution gives help to those in the electrical industry coming within the scope of its operations, who find themselves in temporary distress. The value of such prompt aid in the hour of need is incalculable, and much real assistance has been given in this manner.

"There is little doubt," says Sir Tom, "that the trying times we are likely to experience in all industries (including our own) during the next few years will mean more calls upon us than in the past, and I therefore make a special appeal to you for your support and liberal contributions."

We earnestly hope that the response to this request will be proportional to the urgency of the need. In such matters as this it is essential to take thought for the future, and to be prepared in good time for the coming demands upon the resources of the Institution. How far would £650 go towards providing adequate pensions for our casualties?

The Industrial League and Council.—The first of a series of lectures and discussions on industrial subjects arranged by this organisation was held on Wednesday evening at Caxton Hall. Mr. E. J. P. Benn was the speaker, and his subject was "The Capitalistic System." The meetings will take place every Wednesday from now on to December, at 7.30 p.m., and the subjects arranged for are as follows:—

October 12th.—Mr. C. Jesson, M.P., "The Importance to the Worker of Initiative and Enterprise."
October 19th.—Mr. E. W. Petter, "Economic Axioms of Industry."
October 26th.—Mr. E. W. Mundy, "Profit Sharing and the Coal Settlement."
November 2nd.—Mr. E. C. de Segundo, "Ability as a Factor in the Production of Wealth."
November 9th.—Mr. E. J. Garmeson, "Industry and its Relation to Finance."
November 16th.—Mr. F. S. Button, "The Great Essential to Industry."
November 23rd.—Mr. H. E. Blain, "The Industrial Revolution in England."
November 30th.—Mr. H. H. Elvin. "Some Causes of Industrial Unrest, and a Remedy."
December 7th.—Mr. John Baker, "Some Problems of Unemployment."
December 14th.—Mr. H. G. Williams, "The Cost of Living and its Implications."
December 21st.—Mr. A. Dalgleish, "Trade Boards."

A New Electric Rolling Mill.—Messrs. Hadfields, Ltd., of Sheffield, are installing a 28-in. electrically driven rolling mill of the reversing type, comprising a set of cogging and finishing rolls, for rolling tramway rails. The operation of rolling in this mill will be continuous, the bloom passing automatically from the soaking pit to the rolls through and through until it becomes the finished product. The rolling of tramway rails is a new departure at Hadfields' works.—*Ironmonger.*

A New Wireless Valve.—From the point of view of operating and maintenance expenses it is desirable to reduce the number of valves in use to the lowest possible limit, but until recently any such reduction involved a disproportionate sacrifice of sensitiveness and receiving efficiency. A new valve with four electrodes, which has been brought out by Marconi's Wireless Telegraph Co., Ltd., for use in its marine receiver, performs the functions previously carried out by three separate valves, and thus provides the required degree of sensitiveness with a minimum of expense. In this valve the central straight filament is surrounded by three coaxial cylinders; the first, which is next to the filament, is an open spiral "grid," the second a close-meshed "grid," and the third and outer electrode a thin metal "plate." The three inner electrodes, the filament and the two grids, operate as an ordinary three-electrode valve, but by an ingenious arrangement of circuits two stages of amplification are provided—one high-frequency and one low-frequency stage. An intermediate stage, during which rectification occurs, is provided by the outer electrode or plate acting in conjunction with the filament. The amplifying detector comprising this valve and its associated circuits is installed in conjunction with a compact and simple tuner of novel design having a wave-length range of from 300 to 23,000 metres. A small local oscillator of similar range provides for C.W. reception when required.

Educational.—UNIVERSITY OF LONDON, KING'S COLLEGE.—Special Advanced Engineering Lectures.—The following lectures (a course of five in each subject) have been arranged for post graduate and other advanced students, on Liquid Fuel, by Mr. H. Moore, on alternate Mondays, commencing October 17th; on Liquid Fuel Engines, by Mr. W. R. Ormandy, on alternate Mondays, commencing October 24th; on Bridge Construction, by Mr. H. W. FitzSimons, on alternate Thursdays, commencing October 13th; and on Cascade Induction and Synchronous Motors and Generators, by Mr. L. J. Hunt, on October 18th. The lectures commence at 5.30 p.m. Full particulars can be obtained from the secretary at the College. (See our advertisement pages to-day.)

The Board of Education announces the following successes in the 1921 competition for Whitworth Scholarships and Exhibitions:—*Scholarship.*—W. R. Beach, electrical fitter apprentice, Portsmouth Dockyard. *Exhibitions.*—S. H. Boss, S. Andrew, C. T. Redmond, A. E. Creasey, and J. E. Carr, all electrical fitter apprentices in Portsmouth Dockyard.

Fatality.—A tank, which was suspended above the ground at the electric sub-station at Whitley Bay, collapsed during repairing operations, and Arthur Graham, fitter, was killed. William Hardy, of Newcastle, who, with Graham, was working beneath the tank when it fell, was injured.

Wages in the Electrical Contracting Industry.—The following communications have come to hand, at the moment of going to press, from the National Federated Electrical Association :—

Communication (1).—*Electrical Contracting Industry.*—Variation of wages in accordance with the National Wages Agreements entered into by the National Federated Electrical Association and Electrical Trades Union under dates August 7th, 1920, and September 22nd, 1921.

We, the undersigned, having been duly appointed by our respective societies in conformity with the later agreement as the sub-committee whose duty it is to give effect to the agreements by ascertaining and declaring at four-monthly intervals the variations due (if any) and the net rates of wages payable under the terms of the agreements to each Grade for the ensuing period of four months :

Hereby declare that under the agreements, the variation in cost of living justifies a 10 per cent. variation in wages, and that the net hourly rates of pay applicable to the respective Grades of the agreements, from the end of the first pay period in October, 1921, exclusive, to the end of the first pay period in February, 1922, inclusive, are as follows :—

Grade A, 2s. 3d. (This rate includes a travelling allowance. No further allowances to be paid except as provided by Rule 9 of the London Rules dated February, 1920); Grade B, 2s. 0¼d.; Grade C, 1s. 10¼d.; Grade D, 1s, 8¾d.

Signed on behalf of the National Federated Electrical Association, { Joseph Orringe, H. J. Cash.

Signed on behalf of the Electrical Trades Union, { J. Rowan, J. Kinniburgh, H. P. Bolton.

September 22nd, 1921.

Communication (2).—In accordance with the National Wages Agreement between the Electrical Trades Union and the National Federated Electrical Association, dated August 7th, 1920, the respective parties hereby accept the joint recommendations of their National Executives dated July 20th, 1921, and agree as follows :—

(1) There shall be variations of the April, 1921, rates of all grades, which variations shall be ascertained by a small Committee of both sides in September, 1921, and afterwards at four-monthly intervals, and shall come into operation on the second pay day of the month following the meeting of the Committee for the period covered by that pay day.

(2) Such variation to be 1 per cent. (one per cent.) for each 3 (three) points variation in the Board of Trade cost of living figure ("all items") from 150 per cent. above July, 1914 (taking the average of the figures published on or about the 18th of the month in which the Committee sits and of the three preceding months).

(3) The Committee at its four-monthly meetings shall, in arriving at the rates payable for the ensuing period of four months, calculate the net result of the variation (if any variation be called for by the terms of this agreement); and shall declare the resultant net hourly rate for each grade of the National Wages Agreement of August, 1920, and in making such calculations any final fraction of a penny less than one-eighth shall be ignored, and any final fraction of a penny of one-eighth or over shall be counted as a farthing.

Signed on behalf of the National Federated Electrical Association, { Joseph Orringe, H. J. Cash.

Signed on behalf of the Electrical Trades Union, { J. Rowan, J. Kinniburgh.

September 22nd, 1921.

Electrical Units in Spain.—By a decree of the Ministro de Fomento, the international ohm and ampere are made obligatory in all electric specifications and applications in measuring resistance and current strength.

Electricity v. Gas.—Interesting references to the competition gas has to face were made at the annual conference of the British Commercial Gas Association, held in Glasgow recently. Mr. D. Milne Watson, M.A., LL.B., president of the National Gas Council, and governor of the Gas Light and Coke Co., London, in an exhaustive review of the position of the industry, said that he thought the time might come when gas and electricity might work together in this country as they did elsewhere, each occupying the field where it was most suitable. He said there could be no objection to electricity being supplied cheaply so long as its cheapness was not the product of subsidy by public money, direct or indirect; but they as an industry, must be prepared to sell heat, light, and power still cheaper, or at least as cheaply. It was true that they were able (and in the absence of cheap water power would, he believed, continue to be able) to hold their own in heating and cooking without difficulty if they were progressive in their methods and enlightened in their policy, but in lighting and power they had in many fields a most powerful rival. It had, indeed, already been recognised in many quarters that gas and electricity should work together, but until such a time as that came about they would have to take care that their business was not taken away from them through negligence or backwardness. From the point of view of coal conservation, there was no practical difference between gas and electricity when used for light or power purposes. But when it was heat for heating, cooking, and furnace purposes that the consumer needed, the case with regard to coal conservation as between the two sources of heat supply was very different, and was all in favour of gas. He emphasised the fact that if coal was burned at an electric generating station all the valuable chemical by-products of carbonisation were lost to the community just as much as if the coal were burned in household grates or furnaces.

In a paper, Mr. E. W. L. Nicol described the "Sandwich" system of boiler firing, in which alternate layers of coal and coke were used. From figures supplied by the London County Council power station at Greenwich, it was stated that in addition to a great saving in fuel transport and storage, there was a net saving in fuel costs of about 16 per cent. on all steam generated with the "Sandwich" system of firing. This represented an annual saving at the power station of £8,000. The ultimate and only practical solution of the smoke problem would, in his opinion, prove not to be, as many thought, the universal use of electrical energy, but the provision in adequate quantities of a smokeless combustible. The gas industry held the key to the provision of such fuel, and as its advantages became better known coke as a fuel would have a future which should be limited only by the output and consumption of gas. In the discussion which followed, Mr. Alfred J. Phillips, gas engineer, of the American Gas Association, New York, said competition from electricity was even greater in America than on this side, but in heat treatment and other industrial work, gas had held its own.

The Electric Vehicle Committee.—A meeting of the Electric Vehicle Committee of Great Britain was held at the Institution of Electrical Engineers on September 1st, with Mr. Shrapnell-Smith (senior vice-chairman of the committee) in the chair. The committee considered Mr. Ayton's resignation of his positions as chairman and honorary secretary on account of his appointment as joint managing director of Messrs. Ransomes, Sims & Jefferies, Ltd. Mr. Chattock moved a formal acceptance of Mr. Ayton's resignation, and proposed a vote of thanks to him for his services, saying that he had handled quite 75 per cent. of the work of the committee. After discussion, Mr. Ayton was persuaded to retain the position of chairman until at least March 31st, and Mr. E. E. Hoadley (consulting and resident electrical engineer to the Maidstone Corporation) was elected honorary secretary.

The position created by the refusal of the Electricity Commissioners to authorise municipal electricity supply undertakings to subscribe to the funds of the committee, was then considered. The Commissioners' refusal is based on the contention that the committee, in not possessing a constitution or articles of association, is not an association within the meaning of Section 30 of the Electricity (Supply) Act, 1919. The committee re-appointed the special sub-committee which had considered the question of incorporation and the drawing up of a memorandum of association, and instructed it to make a further report on the subject. The question of the price of energy for charging electric vehicles enforced by certain supply undertakings was considered. An effort will be made by the committee to deal with specific instances, and to encourage the general adoption of a reasonable and attractive system of charging for electricity.—*Electric Vehicle.*

The s.s. "Sophocles."—The new Aberdeen liner, which was launched at the Abercorn Basin, Belfast, on the 22nd inst., has been built by Messrs. Harland & Wolff, Ltd., to the order of Messrs. George Thompson & Co., for the Australian passenger and freight trade. She has a large electrical equipment. The winches for the four derrick posts and eighteen derricks—dealing with weights up to 40 tons—are electrically driven; no fewer than 1,200 lamps are installed, in addition to a number of large cluster fittings and 2,000-c.p. lights for cargo handling. The electric steering gearing is of the "Wilson-Pirrie" pattern, and amongst other apparatus and machinery electrically propelled are the bilge pumps, turbine turning motors, dough mixer, potato peeler, 15 fans varying from 15 to 35 ft. in diameter and having motors from 2½ to 15 h.p. The ash hoists are electrically driven. The plant consists of two turbo-generators, each of 150 kW, and one Diesel emergency set of 75 kW above the water line. The *Sophocles* measures 500 ft. in length, has a beam of 63 ft., and a gross tonnage of 12,300. A sister ship, the *Diogenes*, is well forward, and will be ready for launching early in the New Year.

Optical Signalling.—Prior to the closing of the 1920-21 session of the Glasgow and District Radio Club, Dr. Houston lectured to its members on the above subject at the University. Dr. Houston reviewed the various methods of signalling, but his remarks had reference chiefly to the numerous methods of secret signalling by visual means, which had been tried during the war, including ultra-violet and infra-red rays, polarised light, colour filters, &c. A system invented by Dr. Houston, which used an ordinary telescope and a 1½-volt bulb, was clearly explained and demonstrated, and aroused great interest. Suitable apparatus was used to illustrate each system.

Bombay Engineering Congress.—The Bombay Engineering Congress will meet this year on December 8th and the two following days.—*Reuters' Trade Service* (Bombay).

Electricity Charges: The Operation of the Coal Clause in Contracts.—It may be regarded as an established practice that where separate contracts for electricity supply are arranged with power consumers, the Coal Clause forms part of the terms of such contracts. The clause is framed for the sole purpose of ensuring that producers do not take advantage of the price variations of the raw material nor suffer losses from the same cause.

A member firm of the Federation of British Industries has recently forwarded its electricity accounts especially in order to draw attention to the fact that the Coal Clause has not, in its opinion, operated correctly during the violent fluctuations in the price of coal which have taken place during the space of the last two years.

By calculation this firm shows that the bill could only be justified on a consumption of 6.7 lb. of coal per unit, which, it is suggested, is a ridiculously high figure for a modern power plant consumption. The effect of the Coal Clause has been to increase the price of each unit by almost 300 per cent.

It may be that the clause was framed to meet small variations in the price of fuel, and that the large increases over the basic coal price nullify the value of the clause in preserving fairness in the contract terms. In the case under review the increase above basic price is practically 400 per cent.

Another contributory cause, no doubt, is the fact that the other costs of electricity production, according to the returns made by numerous power companies, have not increased in the same proportion as coal.

In conclusion, the F.B.I. Fuel Economy Department would welcome the opinions of other consumers of power so that the question may be taken up with the supply authorities.—*F.B.I. Bulletin.*

Electric Vehicles.—Mr. J. A. Priestley, cleansing superintendent to the Sheffield Corporation, has since September, 1915, installed a fleet of electric vehicles that now numbers 45. Of these, 24 are fitted with Edison batteries, 11 are Garrett, two Orwell, and eight were supplied by the General Vehicle Co., Ltd.; the Garrett and four others are fitted with Ironclad Exide batteries, while four have flat plate accumulators which are now on trial. The following views of Mr. Priestley, which we abstract from the *Contract Journal*, are of interest. He hesitates to declare a preference for a particular type of battery, but his opinion is that the Edison iron-nickel cell, although it is given a longer guarantee period, has a lower e.m.f., its first cost is higher, and it is more fool-proof than the Ironclad Exide pattern. The latter, besides being cheaper, is better for uphill work, probably on account of its low internal resistance. The advocates of two motors claimed the advantage of dispensing with differential gear, but the single motor gave less trouble. When two were installed it was nearly always the near side motor that got into difficulties. It was urged that with two motors if one gave out it was possible to get home on the other; but, thinks Mr. Priestley, that usually means the ruin of both. The adoption of two motors was probably the result of too slavish a following of tramway practice, for which they were all right, but the conditions were quite different. In the matter of electric vehicles it seemed that everyone began where those before him had begun, not where they left off. The charging current is at present mainly taken from the Corporation supply station, though part is derived from plant driven by steam from the destructor, but the new works to be built will provide all the current required. The lorries run 38 miles daily and with a recharge at noon would do another 30 miles at night. At distances under three miles horse traction is cheaper than electric, while for very long-distance running petrol and steam cars can compete with it successfully.

One of the most interesting vehicles that participated in the Liverpool parade of commercial motor vehicles on September 24th was a 6-ton electromobile lorry employed by Messrs. Tate & Lyle, Ltd., of Liverpool and London, for transporting sugar from the Liverpool docks to the refineries. It has given excellent service during the two years it has been in operation, and is sometimes employed with a trailer. It has the M.V.7 Ironclad Exide batteries, and is recharged at Messrs. Tate & Lyle's Liverpool works. This machine won first prize in the electric class.

Its only competitors were two Ward 1-ton lorries, which are engaged on postal services, the owners being Messrs. J. Blake & Co., Ltd., motor haulage contractors, of Liverpool.

Domestic Electricity Supply in Norway.—A leaflet recently published by the E.D.A. (No. 203), gives some figures relating to the cost of electricity in a typical Norwegian "all-electric" house supplied by a hydro-electric works. There is 14 kW of apparatus installed, including a 7-kW cooking range, fires, washing machine, vacuum cleaner, fan, iron, water heater, and lighting. Electricity is supplied through a current limiter at the price of 18 kr. per 100 volt-amperes per annum plus a war advance of 16.66 per cent. With unrestricted use within the limit, this works out at 210 kr. (at the August 1st rate of exchange, £8 15s.) per kW-year (100 per cent. power factor). The installation dealt with is set at, and pays for, 1.3 kVA, an amount of £11 7s. per annum. In winter coke breeze is used for additional heating, but extra heating energy can be supplied at about .9d. per kWh.

Electricity in the Home.—In a housing scheme which includes the building of a number of five-roomed houses to be let at 25s. a week each, in one of the northern towns, it is proposed entirely to eliminate chimneys. The money saved will be spent in installing electrical equipment, consisting of fires, kitchen range, and the like. The kitchen range will be of a type possessing an elevated oven, so that no stooping is necessary, an innovation which every housewife will appreciate. There is already a "chimneyless" colony on the outskirts of Glasgow.—*Daily Mail.*

INSTITUTION NOTES.

Association of Mining Electrical Engineers.—The annual meeting of the Association was held at Newcastle on September 30th, and October 1st. On the first day the officers were formally elected as follows:—President, Mr. A. B. Muirhead (Glasgow); Vice-presidents, Messrs. G. Raw (Usworth, Co. Durham), and W. T. Anderson (Old Trafford, Manchester); Treasurer, Mr. Alexander Anderson (Wishaw, N.B.). Dr. Thornton, the retiring president, announced the award of the first prize for technical papers to Mr. Sidney Burns, of Newcastle, and the second prize to Mr. G. McLellan, a Scottish member. Mr. A. B. Muirhead, the new president, in his address said the Association had made great strides in the twelve years of its existence, and its early work was now bearing good fruit which was seen in the fact that as an association it occupied a position of first importance in the country's basic industry of coal mining. Speaking of the criticism of the mining industry, he said the Miners' Federation during the recent strikes suggested that the reduction of wages was rendered inevitable not because of economic laws, but by inefficient management and failure to make use of plant and machinery for development, but there was nothing at all advanced to justify this view. The Association had no fault to find with legislation for the regulation of electrical matters in the industry of mining, and it was at all times anxious to offer its experience to the industry.

On the evening of September 30th, the annual dinner was held, when Mr. Muirhead presided.

Association of Engineers-in-Charge.—The 1921-22 session opens on October 12th, with an inaugural address by the president, Capt. H. Riall Sankey, C.B., on "Some Recent Advances in Wireless Telegraphy."

Glasgow Corporation Electricity Department Engineering Society.—The Society held its opening meeting of the session in the head office of the Department on October 3rd, when Mr. R. B. Mitchell, engineer and manager of the Department and president of the Society, delivered his presidential address, Mr. G. Morgan, deputy engineer of the Department and chairman of the Society, presiding. Mr. Mitchell dealt with the progress of the Department during the past year and with its future prospects, and reviewed the effect of certain measures on the development of the electricity supply industry. Mr. R. B. MacCall, secretary and treasurer of the Department, and hon. vice-president of the Society, was also present and addressed the meeting.

Edinburgh Electrical Society.—The first meeting of the new session was held on September 30th, Mr. D. S. Munro presiding, and many new members joined. A lecture on "Magnetic Clutches" was given by Mr. W. E. Townsend. The lecturer referred to the small power required to operate such clutches, and gave an account of the difficulties which had to be overcome in perfecting the design. Methods of overcoming the residual magnetism and so quickening the break on clutches were described. Examples of use of the clutches in Admiralty work, for paper mills, cranes, motor cars, &c., were illustrated.

The next paper, on "Electrochemistry," by Mr. R. W. J. Stark, will be read at the Philosophical Institute on October 14th.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the comercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Personal.—Mr. D. H. Davies, electrical engineer to the Heywood Corporation, and Mr. Thomas Hadfield, an assistant, were severely burned last week while testing a meter at the Heywood electricity works. A short circuit occurred, and the flame caught the two men about the face and neck. Hadfield being also burnt rather badly on the hands. After first aid had been given, the injured men were removed to the Bury Infirmary for treatment. They are progressing satisfactorily.

Mr. George William Holford, whose portrait is reproduced herewith, was born at Manchester in 1871 and educated at Manchester Grammar School. He entered the service of the Salford Corporation 35 years ago, and became general manager of the Corporation Tramways in 1905. He is hon. secretary of the Lancashire and Cheshire Tramway Managers' Association, and has read several papers on electric tramway matters. During part of the war period his services were requisitioned for organisation work at the Ministry of Food. The tramways

Mr. G. W. Holford,
Past President, Municipal Tramways Association (Inc.).

under his charge comprise 75 miles of track; the gross capital expenditure exceeds £750,000, of which £450,000 has been redeemed, while £300,000 has been contributed to the relief of the rates and £160,000 set aside for depreciation and renewals. The annual revenue exceeds half a million sterling, and 80 million passengers have been carried in a twelvemonth. The staff numbers about 1,200 persons. At the annual Conference of the Municipal Tramways Association last year he was elected President of the Association for the period 1920-21.

The marriage took place at Chesterfield on September 24th of Lieut.-Col. J. H. Alexander, M.C., D.S.O., resident engineer at Chesterfield, for the British Thomson-Houston Co., Ltd., and Miss Doris Harrison, of Chesterfield.

Three candidates have been chosen for final consideration for the position of borough electrical engineer of Southport. It is understood that before the appointment is definitely made, a deputation of the Southport Electricity Committee will visit the respective towns of these three gentlemen.

Mr. J. S. Child has resigned his position as joint sales manager to the Edison Swan Electric Co., Ltd., after 30 years' service. At present communications should be sent to his private address, Wormley House, Wormley, Herts.

Mr. T. P. Strickland, assistant chief electrical engineer to the New South Wales Government Tramways, has been appointed chief electrical engineer to the Melbourne Tramway Board.—*Tenders.*

The Australian *Commonwealth Engineer* states that Mr. F. B. Shenstone was entertained at dinner recently by the officers of the chief electrical engineer for railways and tramways, N.S.W., on the occasion of his retirement from the position of works manager, Randwick workshops, to take up the general management of Parkinson (Aust.), Ltd., who are erecting works near Sydney for the manufacture of electric motors. Our contemporary also states that Mr. G. H. Harlow, who for the past four years has been managing the Sydney office for the Metropolitan-Vickers Electrical Co., Ltd., left Melbourne on July 27th by the R.M.S. *Osterley* for England. Mr. Harlow intends spending a few months in England, and will then go to Buenos Aires to open new offices for the above firm, from which all business for the West Coast of South America will be transacted.

We read in the same Australian exchange that Mr. Reg. Gladwell, of Bundaberg, Queensland, who left the Brisbane City Electric Light Co., Ltd., nearly three years ago to join the service of the General Electric Co., Schenectady, on a three years' test course, has passed with distinction, and has been appointed by that company as turbine engineer with the British Thomson-Houston Co., Rugby, where he will study the efficiency of the present methods of ship propulsion, and run tests on turbines installed in some of the modern ships.

Barnstaple Town Council has decided to reduce the salary of the electrical engineer from £425 to £382 per annum, and that of the assistant engineer from £250 to £225, as from September 29th.

Mr. J. O. Wigham, late general manager of Edmundsons' Electricity Corporation, has left for Russia to assist in the organisation of famine relief. He expects to be away for about six months.

NEW COMPANIES REGISTERED.

Select-o-Phone, Ltd. (176,994). — Private company. Registered September 27th. Capital, £100 in £1 shares. To construct, maintain and deal in telephones and other electrical devices, &c. The subscribers (each with one share) are: G. Briggs, 122, Tooley Street, London Bridge, S.E.1, engineer; T. Pettigrew, 122, Tooley Street, London Bridge, S.E.1; S. H. Goodyer, 122, Tooley Street, London Bridge, S.E.1, secretary. The first directors are not named. Registered office: 122, Tooley Street, S.E.1.

Shoreham and District Electric Lighting and Power Co., Ltd. (176,995).—Private company. Registered September 27th. £18,000 in £1 shares. To enter into an agreement between John ver Mehr and to carry on the business indicated by the title. The first directors are: John ver Mehr, 27, St. James's Square, S.W.1, engineer; Stephen Easter, 40, Bankside, S.E.1, gum merchant, each of whom may retain office for three years subject to holding 50 shares. Solicitors: Lawrance, Webster, Messer and Nicholls, 14, Old Jewry Chambers, E.C.

Bordesley Electrical Accessories Co., Ltd. (176,962).—Private company. Registered September 26th. Capital, £5,000 in £1 shares. To acquire the business of an electrical accessories manufacturer, factor and merchant carried on by F. H. Pountney, at 102, High Street, Bordesley, Birmingham, as the "Bordesley Electrical Accessories Co." The subscribers (each with one share) are: F. H. Pountney, 21, Ivor Road, Sparkhill, Birmingham, electrician; W. J. Rigbey, 3, Ampton Road, Edgbaston, Birmingham, solicitor. The first directors are: F. H. Pountney (chairman), W. J. Rigbey (life governing directors subject to holding £1,000 ordinary shares each), and W. Pountney. Qualification of ordinary directors, 100 ordinary shares. Solicitors: James, Rigbey, Son and Brown, 18, Waterloo Street, Birmingham. Registered office: 102, High Street, Bordesley, Birmingham.

L. T. Allen (Ormskirk and Penrith) Co., Ltd. (177,016).—Private company. Registered September 28th. Capital, £1,000 in £1 shares. To take over the business of an electrical and mechanical engineer and general contractor carried on by L. T. Allen at 15, Moor Street, Ormskirk, Lancs., and at Burrowgate, Penrith, Cumberland. The permanent directors are: L. T. Allen, Southport Road, Ormskirk, Lancs.; H. Salisbury, Rose Hill Cottages, Prescot Road, Aughton, Lancs; C. Rider, Mill Brow, Scarisbrick, Lancs. Qualification, £20. Remuneration, £50 per annum divided between them. Secretary: C. Rider. Registered office: 15, Moor Street, Ormskirk, Lancs.

International Electrolytic Plant Co., Ltd. (177,014).—Private company. Registered September 28th. Capital, £11,000 in 10,000 10 per cent. preference shares of £1 each and 20,000 ordinary shares of 1s. each. To acquire the rights and interests of A. E. Knowles in certain patents for inventions relating to electrolytic apparatus for production of oxygen and hydrogen and the production, treatment, storage, application, distribution and use of gases, electricity and other agents. The subscribers (each with one preference share) are: A. E. Knowles, Denecourt, Heswall, chemical engineer; Mrs. N. J. Knowles, Denecourt, Heswall. A. E. Knowles is the first director and life chairman. Qualification, £10. Solicitors: Rowlands and Co., 41, Temple Row, Birmingham.

Asbestos Supply and Covering Co., Ltd. (176,851).—Private company. Registered September 19th. Capital, £1,000 in £1 shares. To acquire the premises at Baltic Yard, Hoe Street, Walthamstow, occupied by F. L. Smith, together with the business carried on by him there, and to carry on the business of proprietors and manufacturers of, and dealers in, various compositions where asbestos is used as a basis, manufacturers of asbestos goods, contractors for boiler and steam pipe coverings and other installations, &c. The first directors are: F. L. Smith, 47, Castleton Road, Walthamstow; C. A. Cronin, 14, Keogh Road, Stratford, E. 15; S. J. Smith, 85, Albert Road, Walthamstow; H. J. Cole, 180, High Street, Walthamstow. Registered office: Baltic Yard, 213a, Hoe Street, Walthamstow.

Baynes Electrical Co., Ltd. (176,835).—Private company. Registered September 17th. Capital, £2,000 in £1 shares. To carry on the business of electricians, mechanical and electrical engineers, &c. The first directors are: J. Kearton, 2a, Hermitage Road, Crumpsall, Manchester; E. C. Thurley, 202, Horton Road, Rusholme, Manchester; R. Moore, 87, Moss Lane, Swinton. Registered office: 29, York Street, Manchester.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Crompton & Co., Ltd.—Capital, £500,000 in 340,000 ordinary and 160,000 preference shares of £1 each. Return dated July 28th, 1921. 326,769 ordinary and 139,770 preference shares taken up. £1 per share called upon 250,007 ordinary and 6,010 preference and 7s. 6d. per share on 133,760 preference. £306,730 1s. 8d. paid in cash, including £621 1s. 8d. on 2,240 forfeited shares, leaving £68 1s. calls unpaid. £160,362 considered as paid, being £1 per share on 76,762 ordinary and 12s. 6d. per share on 133,760 preference. Mortgages and charges outstanding, £137,000.

Cowey Engineering Co., Ltd.—Satisfaction to the extent of £500 on September 12th, 1921, of debentures dated January 8th, 1915, securing £3,000.

Electric Motors (South Wales), Ltd.—Mortgage dated September 1st, 1921, to secure £13,000, charged on certain freehold and leasehold property in Cardiff. Holders: Branksome Chine Steamship Co., Ltd., Imperial Buildings, and C. W. Jones, Boston Buildings, Cardiff.

Simoon Engineering Co., Ltd.—Second debenture dated September 14th, 1921, to secure £5,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: E. Dubois, Riverside House, Twickenham.

Aladdin Lamps (Midlands), Ltd.—Debenture dated September 20th, 1921, to secure £10,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. H. Cochrane, Eshwood Hall, Durham.

Veritys, Ltd.—Satisfaction in full (a) on August 31st, 1921, of mortgage dated September 2nd, 1918, securing £400, and (b) on September 1st, 1921, of mortgage dated April 28th, 1913, securing £900.

General Electric Co., Ltd. (67,307).—Return dated August 4th, 1921. Capital, £6,000,000 in £1 shares (1,800,000 "A" preference, 1,800,000 "B" preference, and 2,400,000 preference). 1,705,790 "A" preference, 1,622,891 "B" preference, and 2,111,975 ordinary shares taken up. £4,418,830 paid. £1,021,820 considered as paid. Mortgages and charges, £3,500,000.

An instrument of charge on Magnet House, Kingsway, W.C. (held under a lease for 98 years from June 24th, 1913), under Land Transfer Acts of 1875 and 1897, dated September 9th, 1921, has been filed. The charge is ancillary to trust deed dated July 22nd, 1921, securing £3,500,000 7 per cent. mortgage debenture stock. The trustees for the debenture stock holders are the London City & Midland Executor & Trustee Co., Ltd., 5, Threadneedle Street, E.C.

Birkdale District Electric Supply Co., Ltd.—Capital, £50,000 in £5 shares. Return dated June 21st, 1921. 9,200 shares taken up. £46,000 paid. Mortgages and charges. £6,000.

Liverpool Electric Cable Co., Ltd.—Capital, £30,000 in £1 shares. Return dated July 12th, 1921. All shares taken up. £7,833 paid. £22,167 considered as paid. Mortgages and charges, nil.

Electrical Finance & Securities Co., Ltd.—Issue on August 11th of £1,500, and on September 22nd, 1921, of £1,000 debentures, parts of a series already registered.

Fredk. R. Butt & Co., Ltd.—Particulars of £5,000 second debentures, authorised June 15th, 1921. Present issue £4,000, charged on the company's undertaking and property, present and future, including uncalled capital.

Northampton Electric Light & Power Co., Ltd.—Issue on September 23rd, 1921, of £6,181 7 per cent. second debenture stock, part of a series already registered.

CITY NOTES.

Stock Exchange Notices.—Dealings in the following securities have been specially allowed by the Committee under rule 148a :—

Monterey Railway, Light & Power Co.—$2,996,562 5 per cent. "A" first mortgage debenture stock; $2,996,562 5 per cent. "B" cumulative income charge debenture stock; and $2,675,092 "C" sinking fund debenture stock.

County of London Electric Supply Co.—£500,000 7 per cent. redeemable debenture stock, issued at 94 per cent., 40 per cent. paid and fully paid, after issue of allotment letters.

The undermentioned have been ordered to be officially quoted :—

City of London Electric Lighting Co.—94,050 ordinary shares of £1 each, fully paid (Nos. 1,105,951 to 1,200,000), and 300,000 8 per cent. second cumulative preference shares of £1 each, fully paid (Nos. 1,200,001 to 1,500,000).

Marconi's Wireless Telegraph Co.—27,532 ordinary shares of £1 each, fully paid (Nos. 2,885,727 to 2,913,258).

Newcastle-upon-Tyne Electric Supply Co.—£633,109 4½ per cent. consolidated first mortgage debenture stock, and £100,000 5 per cent. second mortgage debenture stock.

Siemens Bros. & Co.—300,000 10 per cent. cumulative preference shares of £1 each, fully paid (Nos. 1 to 300,000).

Belgium.—The demand for energy from the generating stations of the Compagnie Electrique Anversoise, of Antwerp, increased from 12,130,509 kWh in the financial year 1919-20 to 14,225,231 kWh in 1920-21, an advance of over 17 per cent. During the same periods the number of clients advanced from 15,872 and 18,073, and the directors in their report express the hope that with a continued increase in the demand, which they fully anticipate, the concern will soon be again on a dividend paying basis. The balance sheet for the year shows a profit of 2,921,892 fr., 639,933 fr. of which are being devoted to depreciation, 2,250,456 fr. to wiping off the loss recorded in the previous four years, as a result of the war, leaving a sum of 32,199 fr. to be carried forward to the current year. Work is at present in hand on the establishment of a new transformer station near the Gare Centrale, Antwerp, capable of accommodating five 1,000-kW transformers, two of which are nearly ready for operation.

Prospectuses.—*Clyde Valley Electrical Power Co.*—An issue of 50,000 8 per cent. cumulative second preference shares of £10 each (of which 18,700 shares have been applied for firm and will be allotted in full) has been offered this week. The list was to close on or before October 5th. The proceeds will be applied to repay money advanced by the bankers and towards meeting the cost of additional machinery, plant, and buildings, required to meet further large and urgent demands for electricity.

Cuban Telephone Co.—According to the *Financial Times*, this company has been offering in New York $4,000,000 first lien refunding mortgage 7½ per cent. bonds, due 1941, at the price of 95 and interest.

The daily Press understands that the *Adelaide Electric Supply Co.* is shortly to raise fresh capital in the London market.

Aluminium Corporation, Ltd.—The directors state that the accounts for the year 1920 have not been completed in time for submission to the annual meeting, which is called for Monday next. It is proposed that the meeting be adjourned until the accounts have been completed. The directors are satisfied that the result of the year's trading justifies them in recommending the payment of the preference dividend (7 per cent.) for 1920.

Parsons Marine Steam Turbine Co., Ltd.—The directors recommend a dividend at the rate of 20 per cent. per annum, free of tax, of which an interim dividend of 7½ per cent. for six months to December 31st was paid, leaving to be carried forward £21,422.

Cuba Submarine Telegraph Co., Ltd.—The directors announce an interim dividend for the six months ended June 30th at the rate of 5 per cent. per annum, free of tax, on the ordinary shares.

Monterey Railway Light & Power Co.—According to the financial Press, the plan of reorganisation has been sanctioned by the debenture stockholders.

STOCKS AND SHARES.

Tuesday Evening.

New issues attract more attention than anything else at the present time in the Stock Exchange markets. Notwithstanding the dearth of money caused by depression in trade and the over-weight of taxation, there still seems to be a good deal of capital available for such new stocks as offer well-covered security with a fair rate of interest. People nowadays think, and not unreasonably, that they ought to be able to get 7½ per cent. on sound stock, and when an opportunity for obtaining this presents itself, there is a rush to take advantage of it.

The County of London Electric Co.'s issue of half-a-million pounds' 7 per cent. debenture stock at 94 affords an illustration of the avidity with which good stocks are snapped up. The subscription-list was open less than three hours, but the stock was covered many times over, and, had the lists remained open for a day, the over-subscription would have been very considerably more. This week, the issue of the prospectus of the Clyde Valley Electric Power Co.'s 8 per cent. cumulative second preference shares of £10 each at par has been available. The underwriting was eagerly sought, and in spite of the company being largely a Glasgow undertaking, there was active demand in the South. Fired by the success of the new issue boomlet, it is not difficult to understand that other companies are looking round to see whether they cannot accommodate the public's willingness to lend money at a time when industry is mostly hard-up for cash.

In the list of Home electricity shares, County of London are ¼ lower at 9, owing to a few shares coming to market on behalf of those who wished to take up the new debenture stock. South Londons at 2¾ have regained the 2s. dividend deducted last week. Otherwise the list is steady, holding its recent improvements. Some of the manufacturing shares are a little better. Edisons hardened to 8s. 9d., and English Electrics to 10s. 6d. On the other hand, Siemens are easier at 1 1/16 and General Electrics at 18s. 9d. Judged by the way in which industrial companies are showing, in their reports, how greatly they are feeling the effects of trade depression, it can hardly be expected that the electricity manufacturing industry will fare better than the rest, so far as the present period of slackness is concerned.

The cable group is unusually quiet. For choice, as the Stock Exchange says, the tendency is dull, and the market is inclined to lay the blame upon the multitude of fresh comers for popular favour at the present time. It is now easier to buy the stocks and shares of the Eastern group, for instance, at the middle prices than it is to sell them at such figures. Small parcels of shares dribble in, and the demand has become languid. Eastern ordinary is an exception, gaining 2 points at 165½. Marconis revolve around 1 11/16, but there has been a spurt in Radio Corporation, the ordinary rising to 11s. 6d., the preference to 10s. 3d. It is still said that the buying pressure comes from the United States.

Interest is stirring in Mexican matters again. A good many bonds are changing hands, though so quietly as to excite little attention. Mexican Light & Power preferred have been steadily rising, and are 6 points better at 25. Mexico Tramways second mortgage bonds at 27 have risen 2 during the past few days. The latter carry arrears of interest at 6 per cent. from July, 1914, arrears which come to over £36 per cent., and are cumulative. It might be very optimistic to look for these to be cleared off in cash, but some day the company will have to promulgate a scheme whereby these back dividends can be dealt with, and a purchase at the present time may be reasonably indicated as a good gamble. The cynic will probably say that the holder is not likely to be worried with income-tax forms in respect of the coupons for some time to come, but even this is an advantage to people who are on the look-out for non-interest bearing stock that has a chance of improvement.

Anglo-Argentine Tramways preference shares are marked down to 2¾, but actually a line of the company's first 5½ per cent. preference shares has come to market from the Continent, and at a lower price. Those who remember the interest which Belgium took in the flotation of this company may shrewdly guess the place of origin of the present shares now on offer at £2 10s. 9d. per share. These shares carry a 5½ per cent. cumulative dividend, and are in receipt of their full rates, the 2nd preference having received, just lately, part of their back dividends. The interest falls due on the 1st July and the 1st January, so that there is about three months' accrued dividend in the present price. The return on the money comes to practically 11 per cent. allowing for this. The shares are to be recommended only, of course, to speculative investors prepared to take a risk in order to obtain a high rate of dividend on their money.

Lancashire Electric new debenture stock after touching 3 premium, went back to 2 premium. The Shropshire, Worcestershire, and Staffordshire Electric Power 7½ per cent. debenture stock has gone back to its par price of 97, a decline which, in the market, is deemed partially due to the clumsy title of the company. It may be more correct to assume that so many new issues are being made at the present moment that people who have a profit on scrip, are ready enough to take it if they see an opportunity for getting into something fresh that also offers a prospect of a premium. The stag is very busy in these latter times. In the case of one issue which came out within the past ten days, and which was very largely stagged, the company received more than 120 applications from one single individual. It would be interesting to know the result of his energy, but the sequel did not reach us.

Metropolitan ordinary stock is ½ higher, on this week's increase in the company's carrying capacity. Underground Incomes are 2 lower at 73½, with revived gossip of a possible new issue. East London ordinary touched 4, to revert to 3¾, and the third debenture is easier at 13.

Last Monday witnessed the public launching of the new Rubber Shareholders' Association, and its inception was sufficiently enthusiastic to arouse logical hopes that it may be able to do serviceable work in the way of extending the uses of rubber, and for assisting the distribution of the enormous stocks of raw material piled up in British warehouses. The iron, coal and steel sections, together with the market for armament shares, remain under a cloud by reason of the difficulties with which the trade struggles, and which are reflected in dividend announcements that compare unfavourably with those of a year ago.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1919.	Dividend 1920.	Price Oct. 4, 1921.	Rise or fall.	Yield. p.c.
Home Electricity Companies.					
Brompton Ordinary	12	12	68	—	£9 8 2
Charing Cross Ordinary	7	8	4½	—	9 8 4
do. do. do. 4½ Pref.	4½	4½	3½	—	7 4 4
Chelsea	4	6	3½	—	9 4 8
City of London	13	14	13	—	10 3 0
do. do. 6 per cent. Pref.	6	6	17.6	—	6 17 2
County of London	8	8	9	— ½	8 17 10
do. do. 6 per cent. Pref.	6	6	8	—	7 10 0
Kensington Ordinary	7	9	4½	—	10 0 0
London Electric	2½	2½	1	—	7 10 0
do. do. 6 per cent. Pref.	6	6	2½	—	10 9 0
Metropolitan	6	7	4	—	8 15 0
do. 4½ per cent. Pref.	4½	4½	2½	—	7 13 2
St. James' and Pall Mall	12	12	6½	+ ½	9 1 4
South London	6	7	2½xd	+ ⅛	10 18 2
South Metropolitan Pref.	7	7	15/9	—	8 17 10
Westminster Ordinary	10	10	5½	—	8 10 2
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	87	—	6 18 0
do. Def.	1½	1½	17½	—	8 14 2
Chile Telephone	6	6	5½	—	5 14 3
Cuba Sub. Ord.	7	7	7½	—	9 6 8
Eastern Extension	10	10	16½	—	6 1 6
Eastern Tel. Ord.	10	10	165½	+2	6 0 10
Globe Tel. and T. Ord.	10	10	16½	—	6 3 1
do. do. Pref.	6	6	91xd	—	6 9 9
Great Northern Tel.	22	24	24½	—	9 14 0
Indo-European	10	10	30	—	8 6 8
Marconi	25	15	1¼	—	8 17 10
Oriental Telephone Ord.	12	12	2⅛	—	*5 16 8
United R. Plate Tel.	8	8	6¼	—	*6 13 4
West India and Panama	Nil	Nil	5/-	—	Nil.
Western Telegraph	10	10	16½	—	*6 1 2
Home Rails.					
Central London Ord. Assented	4	4	48¼	—	8 5 0
Metropolitan	1½	1½	23½	+ ½	6 2 5
do. District	Nil	Nil	16½	—	Nil
Underground Electric Ordinary	Nil	Nil	2	—	Nil
do. do. "A"	Nil	Nil	5/9	— 9d.	Nil
do. do. Income	4	2	73½	—2	*4 1 8
Foreign Trams, &c.					
Anglo-Arg. Trams, First Pref.	5½	12½	2⅜	— ⅛	10 9 6
do. do. 2nd Pref.	Nil	6¼	2⅜	— ⅛	10 9 6
do. do. 5 % Deb.	5	5	69½	—	7 17 0
Brasil Tractions	Nil	Nil	28	—1	Nil
British Columbia Elec. Ry. Ptcs.	8	8	60	—	8 6 8
do. do. Preferred	5	9/9	54½	—	*8 12 2
do. do. Deferred	3	12½/-	55	—	*11 5 2
do. do. Deb.	4½	4½	69	+1½	7 1 8
Mexico Trams 5 per cent. Bonds	Nil	Nil	69	—	—
do. 6 per cent. Bonds	Nil	Nil	57	+2	Nil
Mexican Light Common	Nil	Nil	0	—	Nil
do. Pref.	Nil	Nil	25	+6	Nil
do. 1st Bonds	Nil	5	53½	+2	9 7 0
Manufacturing Companies.					
Babcock & Wilcox	15	16	2⅞	—	8 11 2
British Aluminium Ord.	10	10	15/-xd	—	—
British Insulated Ord.	15	15	1½xd	—	10 0 0
Callenders	15	15	1⅛	—	10 8 8
6½ Pref.	6½	6½	18/9	—	6 18 8
Crompton Ord.	10	10	14/6	—	13 15 10
Edison-Swan	10	—	8/9	+ ⅛	—
do. do. 5 per cent. Deb.	5	5	68	—	7 7 1
Electric Construction	10	10	16/9	—	11 18 10
English Electric	8	8	10 6	+6d.	15 4 10
Do. Pref.	6	6	13 6xd	—	8 11 6
Gen. Elec. Pref.	6½	6½	18/-	—	7 4 6
do. Ord.	10	10	18/9	—9d.	10 13 4
Hesley	15	15	1⅞	—	10 5 0
do. 4½ Pref.	4½	4½	3½	—	6 18 6
India-Rubber	10	—	1½	—	—
Met.-Vickers Pref.	8	8	14	—	8 10 8
Siemens Ord.	10	10	1⅛	— ⅛	*9 8 2
Telegraph Con.	20	20	21½	—	*5 11 9

* Dividends paid free of Income Tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, October 5th.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic per lb.	7¾d.	..
a Ammoniac Sal per ton	£65	..
a Ammonia, Muriate (large crystal) "	£58	..
a Bisulphide of Carbon "	..	..
c Borax "	£31	..
a Copper Sulphate "	£31	..
a Potash, Chlorate per lb.	6d.	..
a " Perchlorate "	6d.	..
a Shellac per cwt.	£15 10s.	..
a Sulphur, Sublimed Flowers "	£16	..
a " Lump "	£15	..
a Soda, Chlorate per lb.	3¼d.	..
a " Crystals per ton	£7	..
a Sodium Bichromate, casks per lb.	7½d.	..
METALS, &c.		
p Babbitt's Metal Ingots per ton	£90 to £275	..
c Brass (rolled metal 2" to 12" basis) per lb.	10½d.	..
c " Tubes (solid drawn) "	1/0½ to 1/0½	..
c " Wire, basis "	11½d.	..
c Copper Tubes (solid drawn) "	1/2½	..
c " Bars (best selected) per ton	£103	..
c " Sheet "	£103	..
c " Rod "	£103	..
d " (Electrolytic) Bars "	£75 10s.	30/- inc.
d " " Sheets "	£145 10s.	..
d " " Wire Rods "	£91 10s.	30/- inc.
d " " H.C. Wire per lb.	11½d.	⅛d. dec.
f Ebonite Rod "	3/6	..
f " Sheet "	3/-	..
a German Silver Wire "	2/9	..
h Gutta-percha, fine "	12/6	..
h India-rubber, Para fine "	1/0½	..
i Iron Pig (Cleveland Warrants) per ton	Nom.	..
i " Wire, galv. No. 8, P.O. qual. "	£30	..
g Lead, English Pig "	£24 5s.	5s. inc.
g Mercury per bot.	£9 10 to £9 12 6	5/- to 7/6 dec.
e Mica (in original cases) small per lb.	3d. to 3/-	..
e " " " medium "	4/- to 8/-	..
e " " " large "	10/- to 20/- & up	..
p Phosphor Bronze, plain castings "	1/4 to 1/9	..
p " " rolled bars and rods "	2/1 to 2/6	..
p " " rolled strip & sheet "	2/2 to 2/7	..
d Silicium Bronze Wire per lb.	1/3½	½d. dec.
r Steel, Magnet, in bars "	1/5	..
a Tin, Block (English) per ton	£155	..
a " Wire, Nos. 1 to 16 per lb.	3/6	..
p White Anti-friction Metals per ton	£65 to £275	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
p ——
r W. F. Dennis & Co.

Rearing Chickens Electrically.—Where facilities are available for obtaining cheap electricity in small country towns, villages, and on farms, it should not be difficult to attract the attention of poultry keepers to the advantages of using electricity for producing the necessary heat for artificially hatching and rearing chickens. With reference to the note on the subject that appeared in our issue of September 2nd, we are informed that the system was introduced a few years ago in the North of Scotland with, it is said, great success, by Messrs. M. K. Cooper & Co., now of Liverpool, but that owing to the war Mr. Cooper was reluctantly compelled to abandon further contemplated activities in this direction. It may, however, be of interest to give some details of tests that were carried out in the spring of 1915 by the Poultry Department of the North of Scotland College of Agriculture, in order to prove the efficiency of this method of raising chickens. The results are stated to have been most successful, and should be of interest to poultry keepers generally. The apparatus used was supplied by Mr. Cooper, and consisted of a "Lo-Glo" incubator and a hover or "mother"; the former had a capacity of 50 eggs, and was fitted with a temperature regulating device and four electric heating lamps each of 32 c.p. The hover was also heated by two lamps of similar c.p., and both pieces of apparatus were constructed of galvanised metal throughout, were simply made, and easy to manage. In one test 31 chickens were hatched out of 40 fertile eggs, and in the other 36 out of 39 eggs. These results are equivalent to 77 and 92 per cent. respectively of chickens hatched from fertile eggs—a comparatively high percentage for artificially hatched chicks. The effectiveness of the hover or rearer is evident from the fact that 65 chicks were reared out of a total hatch of 67, and the quantity of electricity consumed in hatching and rearing each lot of chicks was 41 kWh. The chief advantages of electricity in this connection are the even distribution of heat that is obtainable, which prevents the over-crowding of the young chicks, and the clean fresh atmosphere which is so difficult to get when employing any other methods of heating.

THE MUNICIPAL TRAMWAYS ASSOCIATION (INC.).—I.

THE ANNUAL CONFERENCE AT SALFORD.

The annual Conference of the Municipal Tramways Association was held at the Technical Institute, Peel Park, Salford, on Wednesday and Thursday, September 28th and 29th.

On Wednesday morning the delegates were welcomed by the Mayor of Salford (Ald. F. Hampson, J.P.), who, in his opening remarks, referred to the increased influence which the Association was exercising on behalf of tramway undertakings throughout the country. He trusted that its sphere of usefulness would be still further enlarged as time went on. He also referred to the work of the Association in connection with the settling of labour disputes, and hoped that as its work in this connection became better known and understood, disputes of all kinds would be less frequent and easier of settlement. The tramway industry of this country, to his mind, was destined to be a vital link in the transport system, and he was glad to learn that the Association was working in co-operation with the Ministry of Transport in the interests of efficiency and the well-being of the industry. He regretted that the members of the Association had not with them the late Ald. H. Linsley, D.L., J.P. (late chairman of the Salford Corporation Tramways Committee, and a member of the Executive Council of the Association), who passed away in August last. Finally, he expressed the hope that the visit of the members to Salford would be a happy one, and that the Association would derive material benefit from the Conference.

The President, Mr. G. W. Holford, general manager of the Salford Corporation Tramways, briefly thanked His Worship for the hearty welcome extended to the members of the Association. He then took the chair, and delivered his Presidential Address, of which an abstract follows.

A vote of thanks having been accorded to the President, the secretary (Mr. J. Beckett) read the paper by Mr. J. M. McElroy (general manager, Manchester City Tramways) on "Some Phases of Tramway Development in the Past, and the Outlook." Mr. McElroy was unable to attend the Conference through illness. In reading the paper, the secretary, dealing with the adoption of the decimal coinage system, mentioned by the author, said that Mr. McElroy did not refer to the proposal considered by the Royal Commission, and turned down by it, but rather to the proposal to decimalise the shilling, thus increasing the value of the penny by 20 per cent. That was a proposition which had been submitted by Mr. H. Allcock, of Messrs. W. T. Glover & Co., Ltd., and he had seen nothing anywhere to withstand the weight of the arguments in its favour.

At the end of the morning session a telegram was sent to Mr. McElroy expressing appreciation of his paper, and conveying the heartiest good wishes of the Conference.

The members and visitors were then invited to luncheon at the Town Hall, Pendleton, by the chairman and members of the Salford Corporation Tramways Committee.

In the afternoon the discussion on Mr. McElroy's paper was resumed. At its conclusion, a hearty vote of thanks to Mr. McElroy was carried by acclamation.

Mr. J. B. Hamilton, C.B.E. (general manager, Leeds), then read his paper on "The Operation of Tramway and 'Bus Undertakings under Statutory Powers, in Relation to the Roads Act, 1920."

At the conclusion of the reading of the paper, Mr. Hamilton proposed the following resolution, which indicated the form which the Executive Council thought the remedy for the difficulties dealt with in the paper ought to take:—

"That in the opinion of this Association the competition of motor vehicles with tramways upon inequitable terms relating to (1) local taxation; (2) road maintenance charges; (3) statutory fares for ordinary passengers and workmen; and (4) regularity of service, will result in further increases in tramway costs and consequently in fares, and that, therefore, representations be made to the Ministry of Transport urging the statutory regulation of such competition in the public interest."

Mr. T. B. Goodyer (general manager, Croydon) seconded, and a discussion followed, which is reported below.

In the evening a conversazione was held at the Salford Town Hall, the members being received by the Mayor, the Mayoress, and Miss Hampson. An admirable musical programme was provided, and the recitations of Miss Hampson were much enjoyed.

The whole of Thursday morning, September 29th, was devoted to the discussion on Mr. Hamilton's paper, and a revised resolution which he put forward as the result of further consideration by the Council. The resolution was carried unanimously, and it was further resolved that copies of it be sent to the Prime Minister, the Minister of Transport, and every municipal corporation which owned and operated tramways.

The Conference then adjourned, and the members proceeded to the Town Hall, Manchester, where they were entertained at luncheon by the chairman and members of the Manchester City Tramways Committee. The Lord Mayor of Manchester and the Mayor of Salford were both present.

In the afternoon Mr. W. Chamberlain (general manager, Oldham) read his paper on "Permanent Way—Public Road—Maintenance." Owing to the shortness of time, the paper was not discussed, but it was agreed that those wishing to discuss it later should send their remarks in writing to the secretary, who would forward them to Mr. Chamberlain for his reply. The whole would then be published.

The business of the annual general meeting was then proceeded with. The report of the Executive Council was unanimously approved.

After discussing questions relating to the operation of tramways on Christmas Day, the adjustment of wages on the sliding scale, and holidays with pay, it was proposed: "That in view of the fact that members of the Executive Council are elected by the representatives of the Municipal Tramway undertakings and act for them as a whole, and not for the individual undertakings to which they happen to belong, it be resolved: That the expenses of the said members incurred in attending the meetings of the Council, or in connection with any other business of the Council, be charged on the funds of the Association." This was defeated.

The following officers were elected for the ensuing year:—

President: Ald. R. Mayne, J.P. (Deputy Lord Mayor of Newcastle-on-Tyne and chairman of Newcastle Tramways Committee).

Vice-President: Coun. J. Timpson, J.P. (Mayor of Portsmouth).

Hon Treasurer: Mr. A. R. Fearnley (general manager, Sheffield) was reappointed.

Hon. Solicitors: Mr. S. F. James (town clerk, Ilkeston) and Mr. P. M. Heath (deputy town clerk, Manchester) were reappointed.

Auditor: Mr. J. W. Blakeborough was reappointed.

Ald. H. Clark (Mayor of Rochdale) was unanimously elected a member of Council, to fill the vacancy caused by the election of Coun. Timpson as Vice-president.

Mr. A. L. C. Fell (general manager, London County Council), Mr. J. B. Hamilton, C.B.E. (general manager, Leeds), and Mr. R. L. Horsfield (general manager, Cardiff) were re-elected members of the Executive Council.

At the conclusion of the proceedings, votes of thanks were passed to the retiring President and to the Executive Council. The Conference also recorded its indebtedness to the representatives of the Association on the National Council, for the ability and patience which they had brought to bear on the subjects that occupied

their judgment during the year, and expressed its general satisfaction with the results of the second year's working of that Council. A vote of thanks was also accorded the Salford Corporation for the arrangements made for the conference.

In the evening the annual dinner was held. The principal guest was Mr. Arthur Neal, M.P., Parliamentary Secretary to the Ministry of Transport. Mr. G. H. Roberts, M.P., was also present.

On Friday a large party set off for an excursion by road to Chester in charabancs provided by the South Lancashire Tramways Co. At Chester the members were entertained on the river by the Mayor, the Sheriff, and the chairman of the Tramways Committee.

Presidential Address.

By G. W. Holford (General Manager of Tramways, Salford). (*Abstract.*)

After expressing the loss they all felt by the passing of "one of the most lovable men in the public life of Lancashire," the late Alderman Linsley, for many years chairman of the Salford Tramways Committee, and welcoming the Association on its third visit to Salford, the president said the third year since the armistice found the industry—in common with every other industry—struggling against the backwash of the war. The results of operating tramways in 1920-21 had been adversely affected by the general depression in trade; in spite of the fact that they received a revenue of £27,101,301 last year (which was an increase of £4,044,356 over the preceding year) only five undertakings succeeded in paying their way after meeting the commercial obligation to provide adequately for renewals. Moreover—as was shown at the recent Court of Inquiry—the increased fares had placed a system of passenger transport, which depended for its prosperity upon cheapness and the measure in which it provided for the needs of *all* sections of the community, almost beyond the reach of the poorer section of the public.

Further, they were menaced in increasing measure by other forms of road transport, which enjoyed complete immunity from the exacting conditions of many kinds imposed upon themselves.

The railway companies now proposed to come on the public roads in unmeasured weight and quantity, and that Conference would serve a great public purpose if it aroused throughout the country the cry that municipal tramways were in jeopardy by wasteful competition.

They had emerged from the biggest inquiry into the financial conditions of tramways ever made in this country with an admission that they could not bear any further financial burdens and survive.

The Press of the country was constantly insisting upon the co-operation of the employés with the employers to secure and maintain industrial peace. The National Council was, for them, the main instrument for that purpose, and that industry was greatly indebted to those who had so efficiently served it, at great personal sacrifice, on that body during the past year. Such a Council was fast becoming a recognised need in every industry, in order to hold the balance with an even hand, and to keep in check the natural tendency to utilise the moment of favourable conditions, to secure an unfair advantage for either one side or the other.

It would be the duty of the Conference to consider one of the foremost questions which would again, no doubt, meet them early in the New Year, namely, the employés' wages, for wages constituted the biggest item in their ordinary expenditure.

The tramway industry was not a primary industry in the commercial sense. As it obviously followed, and did not precede, industry in general, it could not be expected to yield, as the recompense of labour, higher wages than were paid in the industries it served. There could not be, permanently, any section of a municipal service in which comparable labour could occupy a privileged position. The total maximum war bonus to tramway employés had been 40s. over pre-war rates, in addition to a maximum of 3s. per week added to the basic rates.

The process of adjusting the bonus, definitely, to the changes in the actual cost of living had begun, and it was reduced by 3s. per week in August. Beginning with 135 per cent. as the basis, the reduction or advance followed the rate of 1s. for every five points variation. The rate of increase—basing 40s. upon 135 per cent.—represented, however, 17.77d. for each five points. Assuming that the scheme remained in operation until the pre-war cost of living was reached, then 13s. out of the 40s. would be the balance of unreduced bonus to add to the basic rate.

There was common agreement that post-war wages would not be allowed to fall to the level of pre-war wages, but whether 13s. plus 3s.—a total of 16s.—could be added in the tramway industry to £1 12s. 8d. and £1 9s. 4d. (the pre-war general average wages of motormen and conductors respectively) was a question that probably no man could determine at present.

The question now before the National Council was a general scheme of wages standardisation, which was being investigated by a special committee.

The relation of tramways to other forms of passenger road transport was exercising the minds of the tramway world. The cost of permanent-way renewal or reconstruction stressed the problem. The alternative method of trolley 'buses upon routes where traffic was not heavy was now being seriously considered. These 'buses paid an excise licence upon their seating capacity, and the operators escaped any obligations for the cost of road maintenance and renewal. They also escaped rating, so far as the roads—the common permanent-way—were concerned. There were factors, however, which must be kept in mind. The maintenance of roads would still be necessary. If the obligation no longer fell upon the travelling public in the shape of fares charged for rides, it would reach them through the channels of rates and taxes to the extent that such cost was not covered—as it did not pretend to be—by the excise licence. This in turn raised the question of the payment of the whole of the cost of maintenance of roads by all the users of the roads, and if that principle were once again laid down, the excise licence would have to be raised to an amount sufficient to cover such cost.

Similarly, other rateable property would bear the local rates now thrown upon tramways. These charges would not cease to exist upon somebody. Clearly they would be merely transferred—not abolished.

Lord Montagu had recently made an attack on tramways in *The Times;* he apparently did not realise that municipal tramway undertakings were essentially public utility services; that they were there to meet the requirements of vast populations of working people who had to be carried to and from their places of employment, and that without such transport facilities these people would suffer great hardship. Nor did he seem to realise that they had been the means of encouraging a large percentage of the population to leave the congested portions of towns and cities, in order to reside in the suburbs, where the environment was of a much more healthy and pleasant character. Tramways were, in fact, necessary for our modern industrial conditions.

During the last parliamentary session no fewer than 36 Local Acts were obtained relating to tramways—a number probably without precedent in the history of the industry.

The Association included within its membership practically the whole of the municipally owned and operated tramway undertakings. There were 102 such undertakings in the country, representing a capital of £57,993,898. During the past year they carried over 3,632 million passengers, and the track operated upon measured 1,705 miles.

The Operation of Tramways and 'Bus Undertakings under Statutory Powers as Affected by the Roads Act, 1920.

By J. B. Hamilton (General Manager, Leeds City Tramways). (*Abstract.*)

Each tramway must maintain the part of the roadway on which it is placed and for 18 in. outside, and although the surface is subject to the wear of all vehicles no financial assistance is granted by the Roads Board Section of the Ministry of Transport. It also pays rates on all its street works in addition to depots, offices, and power stations, and I have made a careful examination and estimate of the annual amount which a tramway provides in the relief of public burdens, with the following result, so far as Leeds is concerned:—

1. Rating assessment on lines only £40,211 at 16s. in the £ = £32,169	
Average amount paid per car per annum	£124
2. Annual cost of paving repairs and renewals, £43,708	
Annual charge per car	168
Total	£292

In many towns the fact is frequently overlooked that the tramway undertaking is usually the largest ratepayer, besides maintaining road surfaces and often paying a considerable proportion of widenings and improvements. These figures, which are comparable with the £70 or £80 paid annually by a motor 'bus, show that apart from its other burden a tramcar contributes four times as much to the public purse as any other form of traction.

Previous to the war there was considerable development of self-propelled internal combustion vehicles utilising petrol or benzol as the propelling force. Powers were granted to public authorities in many cases to utilise these vehicles for traffic in less populated districts, but in all cases during the last eight or nine years a charge for road adaptation and for maintenance of the highways thereafter was imposed.

Until 1916 the curious anomaly was continued under which privately-owned vehicles of identically the same type and road-wearing effect as municipally owned ones, could be run without any corresponding road charges being made whatever. In that year, however, powers were granted to road authorities under the Local Government Board Emergency Road Legislation Act to enforce a road maintenance charge as a condition of operation.

This Act continued in force until the official termination of the war on August 31st last, and gave considerable protection to municipal operators of tramways, as in many cases they are the road authorities in their area and could refuse sanction to ply for hire over their highways. With the death of the Act and the birth of the Roads Act, 1920, a new set of conditions and a great danger to the successful continuance of tramway operation have arisen. An eminent parliamentary agent says:—

"By Section 7 (4) of the Roads Act the Minister of Transport is empowered on the application of a road authority, after holding a public inquiry, to prohibit or restrict the driving of vehicles of any specified class on any specified highway within the area of the council in any case in which it appears to him as the result of the inquiry to be proved 'that a vehicle of that class cannot be used on that highway without endangering the safety of the vehicles or the persons therein or of other traffic using the highway or that the highway is unsuitable for use by a vehicle of that class.'

"This clearly limits the powers of refusal to the three points referred to therein.

"The war having officially terminated on August 31st, 1921, the position now is that Section 37 of the Town Police Clauses Act, 1847 (which has never ceased to be in force) will continue in operation subject to the provisions as to appeal contained in Section 14 of the Roads Act, 1920.

"The effect of this will be that whenever application is made for a licence for an omnibus to ply for hire the application will have to be considered judicially, and that unless there are valid reasons for refusing it the application must be granted without payment of any fee, there being a right of appeal to the Minister of Transport against an unreasonable or improper refusal or against unreasonable conditions attached to the grant of the licence. . . . It is practically certain that a licensing authority would not be considered to be justified in refusing a licence merely on the ground that the running of the proposed vehicles would set up competition with a service of tramways or omnibuses of the authority. . . .

"Section 7 (4) of the Roads Act, 1920, provides machinery by which a County Council or the Council of a county borough may secure the prevention of the use by vehicles of a specified class of specified highways, but the grounds on which such action can be taken are expressly limited, and do not, in our opinion, permit of the taking into consideration of the question of competition with a transport authority of the Council."

The effect of all this seems to be that an owner of a vehicle who has paid the Inland Revenue tax required for carrying passengers cannot be refused on application for right to ply for hire in an area, except upon the three grounds I have referred to.

Neither of these provides any remedy to a local authority or a private company operating under statutory powers tramways, light railways, railless or motor-'bus services on any road on the ground that the service is unnecessary and wasteful in the public interest and injurious to the statutory undertakers.

It is surely a gross misuse of public duties which permits of competition being set up in passenger services by any casual person who may be the owner of a mechanically-propelled vehicle. No examination as to its suitability for this class of work may have taken place, and yet he may run it at any time without obligation with regard to fares or services.

In Sub-clause (3) Clause 14 of the Roads Act, 1920, it is provided that "Where, upon application for a licence to ply for hire with an omnibus, the licensing authority either refuses to grant a licence or grants a licence subject to conditions, in either case the applicant shall have a right of appeal to the Minister of Transport from the decision of the licensing authority and the Minister shall have power to make such order thereon as he thinks fit, and such order shall be binding upon the licensing authority.

"An order made by the Minister under this sub-section shall be final, and not subject to appeal to any court, and shall, on the application of the Minister, be enforceable by writ of mandamus."

On the one hand there is an application to Parliament, a long and careful examination of the necessity for the service, a thorough examination of the physical condition of the roadway, the examination of the details of construction of permanent way and rolling stock, the establishment of a concern which undoubtedly costs large sums of money, the building-up of a permanent service of a more or less remunerative character, the obtaining of the confidence of the public that such a service will be continued, the obligation to provide special services to labouring classes at low fares, and the imposition of a maximum fare for other passengers and goods and parcels, and so on; and on the other hand, an application from a practically unknown person or company in the sense that they have not had to provide any public *bona fides*, the absence entirely of any obligation with regard to fares to be charged or to continuation of services, and the initiation of competitive services, which whilst they may be quite unremunerative to the new-comer, may so impinge upon the revenues of the established undertaking that they are unable to carry on with a low rate of fares.

In recent promotions where local authorities have asked for powers to run omnibuses over routes beyond their boundaries, if there has at any previous date been a service, however slight, by private enterprise, petitions have been lodged and the case fought before the Parliamentary Committee. The first comer has claimed a right to the monopoly of motor-'bus services, and in quite a number of instances has succeeded in inducing committees not to grant natural extension of omnibus services by tramway operators from suitable traffic points.

In statutory undertakings the obligations as to fares and services imposed by Parliament entirely eliminate the possibility of a monopoly of street passenger transport in any form becoming injurious to the travelling public.

Consider the effects of superimposing additional services and competition upon any road which, having regard to the fluctuations of traffic, may be considered as already adequately served. It means that in cases where capital expenditure has had to be met a modified service must be ultimately come to.

If, as would be probable, the competitors would limit their efforts to the period of maximum demand, then it inevitably follows that the ordinary services would be curtailed and the interest and redemption fund upon the original outlay would increase per mile as the mileage decreased.

To meet this service of debt the public would require to be charged higher fares, and this action and reaction might go on until it was impossible for a statutory undertaking to continue to operate on a self-supporting basis.

Suppose, then, it were withdrawn, what now remains?

The service formed in consequence of the Roads Act, 1920, without any liabilities beyond the payment of a licence duty and Inland Revenue tax for road maintenance, without any obligation with regard to fares or services either special or ordinary, and with no rating assessment beyond that imposed upon depots and offices.

I say that Parliament has undoubtedly, in considering the claims for the establishment of services and in granting these, intended that monopolies of transport on the highways under consideration should be formed. A parallel for this view can be found in other public utilities, such as electricity, water, and gas undertakings. In all of these, monopolies have been set up by the clear and expressed wish of Parliament, and no overlapping or competition is permitted with them in the slightest degree.

It seems evident, therefore, that action must be taken by Parliament to prevent the menace of uneconomical competition and great waste of public expenditure which is possible to occur now under the powers set up by the Roads Act, 1920.

In quite a number of towns in the country already services have been set up over tramway routes, and also, in many cases, over railless and omnibus routes which have long been established and are working in virtue of statutory powers.

The present peril is not directed against tramways *per se*, but against municipalities and private companies which operate under statutory powers tramways or 'bus services on routes which they have established very often at great cost.

It is, therefore, of the utmost moment that the members of this Association, who are responsible for the carrying-on of these great undertakings, upon the maintenance of which much of the comfort and prosperity of the country depends, should make their undoubted power in Parliament felt so as more clearly to define their rights and privileges obtained after full examination by Committees of both Houses of Parliament and by Parliament itself.

Discussion.

Ald. C. Higham (Blackburn), in supporting the resolution, which was put forward by Mr. Hamilton (see p. 481), dealt at some length with the position of the municipally-owned tramway undertaking at the present time. The present chaotic competition was a very great danger indeed, to small undertakings especially. They just existed by being able to take advantage of the rush hours, so to speak. Throughout certain hours of certain days of the week the tramways were running at a loss. During some of the hours in which they might be able to make the tramways pay their way to make up for the loss, the duty of giving special facilities for workmen was imposed upon them, and they could not distinguish between workmen and other classes of passengers. When, however, as in the case of a football or cricket match, there were plenty of people prepared to fill the cars, along came somebody else with charabancs and picked up the passengers. These omnibuses varied their charges in accordance with circumstances. Another point to consider was that these 'buses were running on roads not made for the purpose, in many instances, and in consequence, considerable damage was done to water and gas mains. The resolution should be emphatically supported, not only in the interests of tramway undertakings of the country, but in the interests of public safety and convenience. Surely it was not a great thing to ask that anyone plying for hire should be subject to the same limitations as the tramway undertakings, or that the latter should be given the same opportunities for making their undertakings pay as were given to anyone who could afford to buy a charabanc and pay about £70 for a licence to run it.

Coun. R. L. Berry (Aberdare) said that some time ago application had been made to his Council by people living some distance outside the area for power to travel over the roads of the district. This the Council refused, but when the applicants appealed to the Ministry of Transport, the Ministry advised the Council to draft the licence subject to the licensees' not taking up passengers on the roads served by the Council's tramways. That was a concession towards the object of the resolution, and showed what might be done.

Mr. E. S. Rayner (general manager, Hull) said that Parliament had granted enormous sums of public money, and it was only reasonable to expect that Parliament should give the people to whom these sums were granted legitimate protection after they were expended. Municipal authorities had to prove to Parliament the necessity of a service before they were granted powers, but in no case was a man who proposed to run omnibuses asked whether an adequate service already existed along the particular route for which he was applying for power. This unfair competition was going to force them either to run a reasonably cheap service and throw the loss on the rates, or else to run such an expensive service that it would be of no use to the workmen. Furthermore, the people who had the powers to compete with them could not substitute the service which the tramways would have to withhold.

Mr. H. P. Stokes (general manager, Plymouth) asked whether it was proposed to work in unison with the Tramways and Light Railways Association, because the present peril affected both municipalities and statutory companies.

Ald. W. C. Fenton (Sheffield) referred to the clause in the Roads Act which gave power of appeal by people who had been refused licences, or obtained them with certain conditions, to the Ministry of Transport, which he thought was a most unjust arrangement. If justice was to be done to municipal tramways, that was one of the clauses which should be repealed, because the local authorities knew best whether competition should be instituted in the district or not.

On Thursday, September 29th, the Conference resumed the discussion on Mr. Hamilton's paper.

Mr. Hamilton, dealing with the resolution which had been put to the meeting, said that the Executive Council felt that it was a little too narrow. It based their case upon unfair competition alone. He had written his paper under the guidance of their legal adviser, whose view was that the Roads Act, in its operation, if carried out literally, was contrary to the intention of Parliament. He himself thought they should bring forward a resolution embracing that, and therefore he would propose a resolution which would place their position on broader lines than the one submitted on the previous day. It was not a question for the municipal tramways only, but for the whole of the travelling public. Therefore, they would like to take up the position, first, that the operation of the Act was contrary to the spirit of Parliament, and secondly, that it would be wasteful and most unfair to the public forms of transport they had to carry on. They had seen in the Press that morning a statement, which he hoped those wishing to speak would absolutely nail to the table, as being improper and absolutely incorrect, to the effect that tramways had passed away. He would say that the tramway for urban services, and for density of population, was unequalled, and would be unequalled for many years to come. The resolution was as follows: "That in the opinion of this Association, representing the whole of the municipal tramways of Great Britain, the Roads Act of 1920 encourages wasteful and overlapping competition with statutory undertakings, which will inevitably result in increased travelling charges to the public, and is contrary to the intentions of Parliament, and that, therefore, representation be made at once to the Minister of Transport urging the statutory regulation of such competition in the public interest."

Mr. A. L. C. Fell (general manager, London County Council Tramways) seconded the resolution.

Coun. E. Lee (St. Annes-on-Sea) supported the resolution. His Council had spent a large sum of money on taking over the undertaking of a private company to run its cars from Blackpool to Lytham, and now no fewer than 500 charabanc journeys a week were being made between these two places, mostly in competition with the tramways. Free competition was good for everybody, but it must be fair competition. These charabancs were not run at regular intervals, and sometimes the charges were varied. His Council had had a similar application made to it as had the Aberdare Council, some three months ago. It approached the Ministry of Transport, who sent down an inspector to make inquiries. Despite the fact that the Council had pointed out that the tramways covered the requirements of the public, and that the Council had powers in the Bill to run motor omnibuses at any time it was considered the public convenience demanded it, the inspector went away giving them the impression that the Minister would grant power to the outside company.

Mr. L. C. F. Bellamy (general manager, St. Helens) referred to Mr. Hamilton's reference to public authorities being granted powers to run motor vehicles, where he said that in all cases during the last eight or nine years a charge for road adaptation and maintenance thereafter was imposed. In the last session of Parliament Mr. Hamilton had made a terrific effort for all of them to get this question of adaptation put right. He had claimed that Parliament had never intended that motor 'buses, company or municipal, should pay anything more than the Excise licence. The St. Helens Corporation had had inserted in its Bill a clause which provided that it must pay for the adaptation of the roads over which it intended to run 'buses. The result was that it had powers to run its 'buses subject to the Lancashire County Council or the Ministry of Transport telling it how much it must pay towards the adaptation of the roads. That was very improper. If the Corporation had to pay a large sum to the Lancashire County Council for remaking the roads, it was an invitation to the County Council to remake the road and get as much as it could out of the omnibus undertaking. Not only that, but it was making better roads for competitors. The St. Helens Corporation had sought powers to run motor-'buses over its own tramways outside the borough boundary, if necessary, where the Tramways Committee was, in fact, the highway authority, but the powers were not granted.

Mr. C. Clarke (general manager, Birkenhead) mentioned his experience with motor 'bus undertakings. In 1914 his Corporation had obtained Parliamentary powers to run motor omnibuses to a village about 2¼ miles beyond the tramway terminus. That meant running outside the borough into the county area. Later, a company commenced operations, and applied to the county for permission to run over a portion of the borough route up to the borough boundary, which was granted. The company then applied for permission to run over a further portion of the 'bus route, to the tramway terminus, but the Corporation refused licences. That was twelve months ago. The company appealed to the Ministry of Transport, but before the Ministry's decision was given, the company commenced running to the terminus. The Corporation told the Ministry that the company had run its vehicles into the borough illegally before the Ministry's decision was given, and the Corporation refused to have any further dealings with it, but had not heard anything further.

Ald. E. H. Sellers (Huddersfield) mentioned how Huddersfield had dealt with a similar case to that mentioned. In this case the competitor was told that if he did not go away and leave the Corporation to its rights, the Corporation would put a service on the road and run him off, and that if he would not be run off the road by fair means, the Corporation would institute a penny fare. This frightened the man, with the result that he had left this particular route to the Corporation.

Ald. R. Mayne (Newcastle-on-Tyne) also dealt with the handicap of a statutory undertaking as compared with a private undertaking, especially with regard to regular services. If the public could only realise that they might be left to a haphazard method of carrying them, rather than to a well-regulated method, he thought public influence would be brought to bear upon Parliament.

Coun. A. Digby Willoughby (Hull) said he considered that during the course of the next two years the tramway undertakings would recover. Very few tramway undertakings were capable of dealing with large crowds alone, and to his mind, in his own city, it was a very good thing that they could have charabancs to move the passengers.

Mr. W. T. Young (general manager, Dundee) said that his Corporation had applied last year for a Provisional Order to enable it to run 'buses outside the city area. During the time when the Provisional Order was deposited and obtained, a competitive syndicate began to run 'buses over every one of the routes stipulated in the Order, with the result that when the matter was before the Parliamentary Committee, the syndicate appeared as objectors on account of the fact that services were already in operation. He had come to the opinion that under the Model Clauses Act no Corporation in Scotland would be permitted to run outside its borough boundary, and he proposed that after the words "statutory regulation" in the resolution, the words "of motor vehicle traffic by competitive corporations and companies either inside or outside the city areas" should be added.

Mr. W. Murray (general manager, Walthamstow) mentioned a case in which a municipal tramway undertaking was competing with an omnibus undertaking, and in which the municipal undertaking had felt compelled to raise its fares, and establish a minimum. The 'buses elsewhere had also been in the same position, and had found it necessary to establish a 1½d. minimum fare. In this particular locality where it was competing with the tramways, however, the company did not raise its fares, and when it was approached in this connection it stated that it could not see its way to raising the minimum fare. Referring to the great amount of influence which these omnibus combines possessed, Mr. Murray said he knew of one authority which went to the Ministry of Transport for powers to run railless trolley 'buses to a new housing scheme, but was told that there was no need, the advice of the Ministry being that it should apply to the 'bus company and ask the latter to run a service. He suggested that after the words "will inevitably result in increased travelling charges to the public," the words "prove ruinous to the tramway industry and finally result in imposing intolerable financial burdens on tramway-owning municipal authorities" should be added.

Coun. W. J. Squires, J.P., L.C.C., supporting the resolution, contended that no form of transit or transport which was going to compete with municipal tramways should be permitted to operate until it conformed to the regulations and conditions which were placed upon municipal undertakings. It seemed to him that the only remedy was the one which the resolution would embrace, and that was, to go to Parliament. He was not a pessimist as regarded the future.

Mr. J. S. D. Moffet (general manager, Belfast) said that given fair competition, he was sure that no motor vehicle could hold its own under the same conditions. There was no comparison between the London area and the provinces. In London there was four or five square miles with a teeming

population untapped by anything but motor 'buses and underground railways. He agreed that some action should be taken to stop the unfair competition which was going on, but he would not like it to go out that they were afraid of reasonable and fair competition.

Coun. W. T. Newling (East Ham) also referred to the sufferings of the metropolitan boroughs from unfair competition. In East Ham there were a dozen different services running through the borough, taking a huge amount of revenue away from the tramway system every day. A poor undertaking struggling to pay its way would have to inflict a heavy deficit year after year on the ratepayers, because something to the tune of £130,000 per annum was being taken out of the borough by unfair competition.

Coun. J. Crabtree (Keighley) said that recently one of the principal companies in the town had asked for permission to run charabancs on one of the tramway routes, but permission had been refused. The company then wrote a letter to the effect that the Council could not refuse permission, and that it had only asked out of courtesy. It would, therefore, put its vehicles on the road and compete with the tramways.

Mr. A. L. C. Fell (general manager, London County Council Tramways) said that in London they had been ploughing a lonely furrow. When it was considered that on the tramway routes in London they had had to pay £820,000 for widening streets, over which the omnibuses ran, and in addition, £140,000 a year in permanent-way rates, while the 'buses were paying nothing, it was simply a scandalous position. He also referred to the London County Council's attempt last year to get powers to extend the traffic from dead-end tramway terminals by using motor 'buses; it was told that as there was a private company operating, that company should be asked to supply the needs before the London County Council was given the powers. In conclusion, he referred to a paragraph in the report of the Select Committee on Transport in the Metropolitan Area, in which the committee stated that there should be equal financial treatment of all surface locomotion.

Ald. D. J. Davies, J.P. (Mayor of West Ham) said the only solution of the whole matter was that local authorities should have the last word in respect of allowing other people to run through their routes.

Mr. Hamilton suggested that the resolution as originally put that morning should be sufficient to enable the Executive Council to carry it into effect.

Mr. L. E. Harvey (general manager, Ilford) suggested that the Light Railways Association should be approached, with a view to obtaining the support of that body.

The President said the matter had been considered by the Executive Council, and it was thought proper that the resolution should be confined to municipally-owned tramways.

Mr. Murray's amendment was put to the meeting, and defeated by a substantial majority, and the resolution as already given was carried unanimously. It was further resolved "That copies of the resolution be forwarded to the Prime Minister, the Minister of Transport, and to every municipal corporation that owns and operates tramways."

NEW BOILER-HOUSE PLANT AT WIMBLEDON ELECTRICITY WORKS.

In common with other electricity stations, the Wimbledon undertaking has experienced a steady development of the demand for electricity supply. In the early years of its existence the district served was chiefly residential, and it is still largely so, but the demand for electricity for industrial purposes has been steadily increasing, and the industrial factor may soon become of very great importance. In 1910 the total number of units generated was 3,052,933, as against 4,988,230 for 1920, an increase of 1,935,297 units. Analysing these figures further, we find that in 1910, of the total units sold, those for lighting purposes amounted to 1,708,659, whilst in 1920 the figures were 1,939,175, an increase of only 230,518. On the other hand, the power units, which in 1910 were only 503,274, amounted in 1920 to 1,676,687, an increase of 1,173,413. This figure was only once or twice exceeded during the most strenuous days of the war, and represents a continuous increase in the demand for power for industrial purposes.

Wimbledon, although an old station, and not too conveniently planned, possessed at least the advantage of being able to place its new boilers in such a position as regarded the generating plant as to secure a much higher overall thermal efficiency than could have been obtained by extending the already existing boiler house.

This new boiler-house plant consists of two "Spearing" water-tube boilers (fig. 1), each having an evaporating capacity of 25,000 lb. of steam per hour at 250 lb. per sq. in. pressure, with a superheat of 250 deg. F. These boilers are fitted with "Bennis" chain grate stokers (fig. 2) and "Ferguson" superheaters. The gases pass out at the back of each boiler along a flue under each boiler, and these two flues converge into a short main flue which is connected to a steel chimney about 70 ft. high. A "Sirocco" motor-driven induced-draught fan is installed at the base of the chimney, with the usual damper arrangements. An ash tunnel is built beneath the boilers and flues. The valves and fittings were manufactured by Messrs. Shaw, Son and Greenhalgh.

The battery of boilers, with its flues, chimney, &c., is one complete self-contained steam-raising unit, the intention being that any further extension should be by similar units.

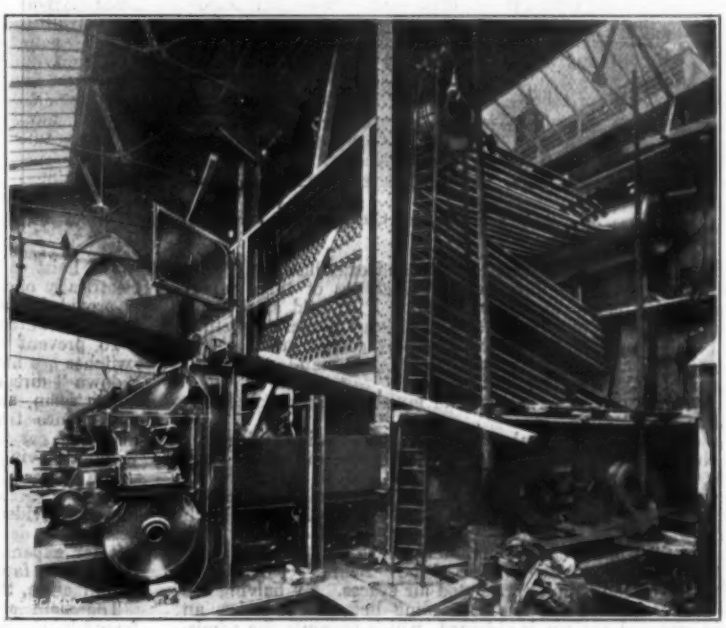


Fig. 1.—Spearing Boilers and Bennis Stokers in course of Erection.

The "Spearing" boilers have been constructed to the specification of Mr. H. Tomlinson-Lee, the borough electrical engineer, by the Spearing Boiler Co., Ltd., the principal contractors. The specification prescribed a factor of safety of 5.5. There is thus a considerable margin for wear and tear above what is requisite for safety at working pressure.

It will be seen from the illustrations that there are three drums, namely, the main steam and water drum, 4 ft. in diameter; the top circulating drum, 3 ft. in diameter; and the bottom reservoir mud drum, 2 ft. 6 in. in diameter. Each of these drums has a distinctive function beyond that of thermal storage.

Next to the main steam and water drum the reservoir mud drum is the most vital link in the design of the boiler, combined with the down-comer pipes which connect the main steam and water drum with the reservoir mud drum. The down-comer pipes in this case are 8 in. in internal diameter. The feed water is delivered into the usual type of trough in the main steam and water drum, and by gravity travels down the down-comer pipes into and through the mud drum. The result is that all the water in the boiler must circulate and recirculate during working operation through the mud drum, which thus becomes a real mud collector. In this respect the "Spearing" boiler radically differs from all other header types of boilers, through the mud boxes of which there is no circulation, the water in them being stagnant except when the blow-off cock is open. Another purpose served by the reservoir mud drum, which again distinguishes the Spearing from the other header types of boiler, is that the water is supplied to the steam generating tubes in the natural order; the bottom tubes, which do the greatest proportion of the evaporation, get their water first, and the upper tubes later in the true order of their demand.

Again, the nipples connecting the headers to the bottom

reservoir drum and the front circulation drum are 4½ in. in diameter, that is to say, they have an internal area of about 14 sq. in. Four-inch nipple tubes have about 11 sq. in., so that 4½ in. nipples have about 28 per cent. more area for the inlet and outlet of water and steam to and from the headers. The circulation through the tubes and headers is thus greatly improved.

A further distinctive feature is that the headers are straight and not sinuous. It is claimed that this facilitates circulation, and that other advantages such as more uniform thickness in construction and ease in cleaning are obtained.

The front circulation drum also deserves remark. Its value is in steadying the circulation, increasing the thermal storage, and in checking surging at high rates of duty. There is also the advantage that it enables the upper row of tubes connecting the front circular drum to the steam drum to be made steam carriers. These steam tubes also act as steam drivers.

The number of tubes in each boiler is 308, contained in 22 sections. The diameter of the tubes is 4 in. and the length 18 ft.

The superheater is of the well-known Ferguson type, and consists of 22 complete sections, comprising three solid-drawn steel tubes 1¼ in. external diameter, and 1¼ in. internal diameter. Each section of tubes can be withdrawn or inserted separately from the rest. This facilitates repairs and inspection. As the superheater is fitted in the side, and the headers and joints of the sections are accessible without entering the boiler flues, the joints can be seen and examined, and tube withdrawals effected if necessary. Each set of three superheater tubes is expanded into a square 1 in. mild steel plate. The plates are secured to the superheater headers by studs and nuts, and the joints are made by copper and asbestos rings. We are informed that these joints stand up to 850 deg. F. in direct-fired superheaters.

Each superheater is designed to give 250 deg. superheat at full load.

The borough electrical engineer's specification called for mechanical stokers suitable for burning Midland nutty slack (10,500 B.th.u.) with induced draught, and so designed that they could be hand-fired if necessary. The mechanical stokers fitted are "Bennis" chain grates, two to each boiler, each 6 ft. wide by 13 ft. 9 in. long, giving a total effective grate area in each boiler of approximately 165 sq. ft.

The grates (fig. 4) are built up of the "Bennis" patent links with halved joints and corrugated air spaces. By halving the link at the joint with the succeeding link in the series, an uninterrupted surface is obtained, which prevents the admission of an excess of air, whilst it ensures a sufficient supply for perfect combustion, and the continuous surface avoids the possibility of ashes passing through the joints of the links when passing over the grate drums. The corrugated air spaces, evenly divided, prevent thin flaky fuel passing through the grates.

Provision is made in the design to hold broken links in the correct position, to prevent them falling and causing breakdown. This is achieved by each link being fitted with dowels which project from the side of the link. The dowel fits loosely into a corresponding recess on the next link, so that in case a link breaks it is impossible for it to fall out of position. The grate can thus continue running until it is convenient to replace the link.

Each grate is provided with a totally enclosed change-speed gear box, which allows six variations in the speed of the grate, so that the speed of travel can be regulated within wide limits. The starting and stopping of the stoker and the variations of speed are effected through the gear box. The gear is operated by means of a handle arranged to engage with the notches of a gate. It is impossible to interlock more than one gear at a time, and the grate can be put out of action through the gate change at any point, without having to go through intermediate gears.

The motion of the drive is continuous, ensuring smoothness in running, and provision is made on the driving gear for automatically stopping the grate in the event of jamming.

The stokers are driven by belt from a continuous line-shaft running overhead, the bearings being carried on the stoker jamb columns immediately behind the chain grates. The shafting is driven by belt from a 10-b.h.p. "Brook" motor.

An underground system is employed for handling the ashes. They fall over the end of the chain grate stokers on to radial dumping plates, from which they are dropped when necessary into capacious hoppers which are sufficiently commodious to hold the ashes of about an eight-hour full-load run. From them the ashes are discharged into an ash truck, which is pushed by hand along a light track laid on the basement floor, to an electric hoist placed at the end of the ash tunnel. The truck is large enough to hold from 4 to 5 cwt. of ashes. It is raised to the boiler-house level by the hoist, passes through the boiler house, and outside to the tipping platform.

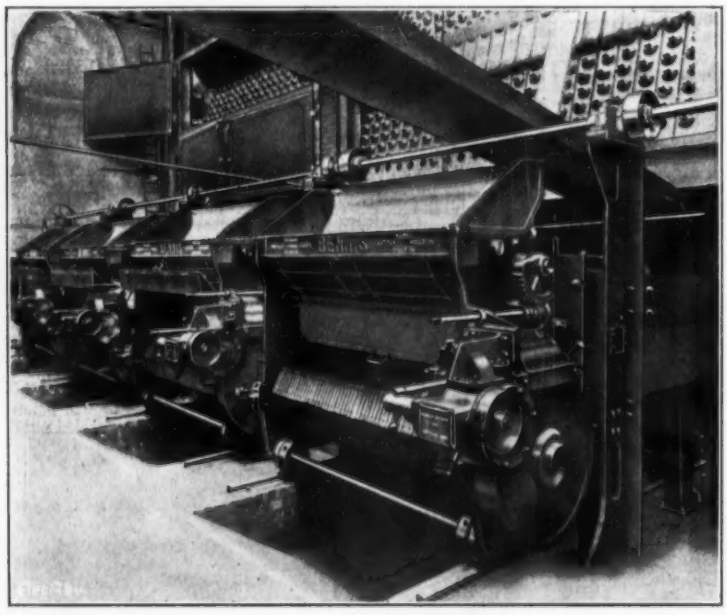


Fig. 2.—"Bennis" Chain Grate Stokers.

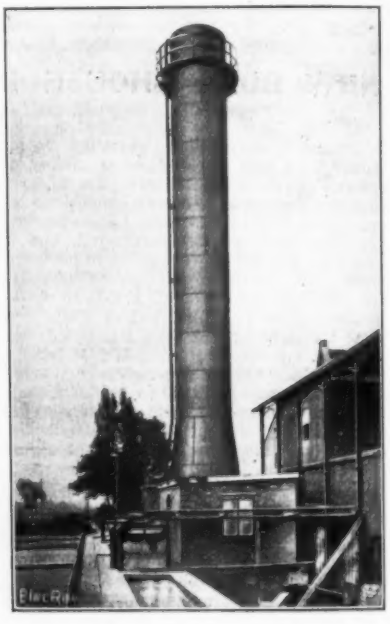


Fig. 3.—Steel Chimney.

The hoist consists of a substantial steel structure with an electrically operated travelling car, and balance weights. It is provided with two vertical sliding iron gates which open and close automatically as the car travels.

To prevent overwinding at each end of the travel, limit switches are fitted which break the circuits of the "up" and "down" directions respectively. This switch is fitted in the motor room, and is operated by the car should the latter by any chance travel past the direction limits. It breaks the main and car feed circuits, and can be replaced in a moment without having to wind the car and balance weight.

The induced-draught installation consists of a 55 in. diameter "Sirocco" fan, semi-upcast, full housing type, made by Messrs. Davidson & Co., Belfast. The construction is specially designed to deal with hot gases, and ample wheel clearance is left for expansion when dealing with gases at high temperatures. The fan is driven by a three-phase motor of E. Brook's manufacture, through a "Hans Renold" double driving chain.

The chain is enclosed in a gear case which is provided with forced lubrication. The motor is arranged for a speed of 960 r.p.m., and the fan speed is 380 r.p.m., requiring for maximum duty 37 b.h.p. The intensity of the draught produced will be equal to that of a chimney 180 ft. high, working under purely natural draught conditions.

The steel chimney is self supporting, and is 60 ft. high above the brick base. It is 7 ft. diameter tapered outward to 10 ft. at the base. The first 12 ft. from the base consists of 5/16 in. thick steel plates, and the remainder consists of ¼ in. thick steel plates.

The feed pump is one of Worthington-Simpson's 14 by 9 by 24 in. vertical simplex double-acting piston pattern pumps, capable of delivering up to 10,000 gallons of feed water per hour against boiler pressure.

The pump is fitted with the latest type of steam valve gear.

which is of very simple construction, the working parts consisting of a main slide valve which controls the admission of steam to the main steam cylinder, a steam-thrown plunger which operates the slide valve, and a small auxiliary slide valve, which controls the motion of the steam-thrown plunger. These three parts, together with the valve rod connections to the lever, which move the auxiliary valve, make up the whole working mechanism. It is particularly adapted for operation

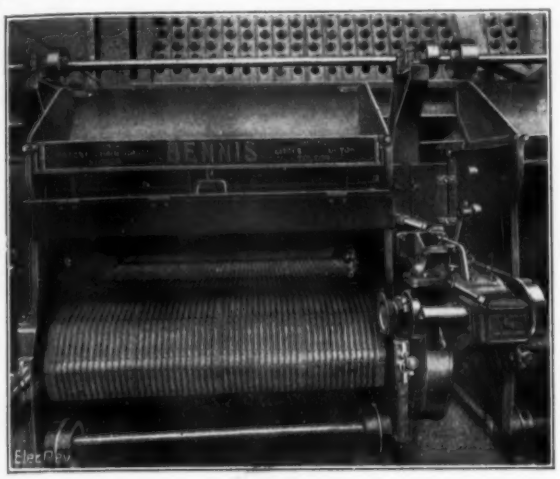


Fig. 4.—Grate of Bennis Stoker.

with high-pressure steam, the small auxiliary valve being the only working part directly connected to the valve rod, which valve, due to its small area, is subject to but little friction from the pressure of steam upon it, and consequently wear and strain on the connections are minimised.

The difficulties of lubricating at such temperatures being overcome by the design of the parts, the mechanism can, if necessary, run perfectly without any cylinder lubrication at all. The auxiliary cylinder carrying the steam thrown plunger is at right angles to the length of the main cylinder, in order to give the necessary support to the weights of plunger and main valve, thus preventing any possibility of the parts dropping and short-stroking the pump. From this construction, it follows that the auxiliary steam valve moves in line with the main piston rod, while the main valve operates at right angles to it.

Acknowledgments are due to Mr. H. Tomlinson-Lee for facilities to obtain photographs, and to the manufacturers for particulars of the plant.

LEGAL.

F. W. Harvey & Co. *v.* New Enterprises, Ltd.

At Marylebone County Court, last week, before Judge Walworth H. Roberts, plaintiffs, electrical manufacturers, of 15, Edbrook Road, Paddington, sued defendants, of 69, Church Street, Edgware Road, W., for £30 for goods sold. Plaintiffs' case was that at defendants' picture palace in Church Street, there was installed an electric generator, but it commenced running badly and plaintiffs were asked to see to it. They completely overhauled the machine and supplied new parts where necessary. Defendants' case was that they refused to pay plaintiffs the amount charged because the work was not properly done. Mr. James Lambert, general manager of the theatre, stated that after the work had been done the generator frequently stopped, and continued like this for about three weeks, the result being that he was at a loss of about £30. It emitted showers of sparks and became very hot.

In reply to several questions, a witness stated that the machine was of German make, and suited for 2,000 revolutions a minute, but was unable to withstand 2,800 revolutions a minute at which it was sometimes driven.

A witness for the plaintiffs stated that the reason the machine became hot was either that it received insufficient lubrication or else some foreign substance got into the generator.

His Honour gave judgment for the plaintiffs for the amount claimed with costs.

Charles Peacock & Co., Ltd., *v.* J. R. West.

At Marylebone County Court, before Judge Walworth H. Roberts, last week, plaintiffs, of Clapham, sued defendant, of Brondesbury, for £70 14s 2d. for goods sold.

Evidence was given by the manager of the repetition wood work department in plaintiffs' works, who stated that in January, 1920, Mr. West gave an order for a number of fuse boxes which were to be made of Cyprus stained teak wood, at the same time supplying a box as a sample of what he required. Plaintiffs duly delivered a number of boxes, but they had not been paid for, except so far as the delivery up till February was concerned. Defendant had contended the boxes were not equal to sample, and when witness attended with him at the Electrical Supplies Co., Tottenham Court Road, he (witness) was shown a piece of stained wood, a material which witness denied was similar to that of the sample box originally given by the defendant. Witness had known that the defendant had some connection with the Electrical Supplies Co. The piece of wood was stained walnut.

Later in the hearing, Mr. A. Farr, merchant and electrical supplies manufacturer, of Kennington Road, said he was asked to attend at defendant's works to examine some of the boxes in question. There were about 300 boxes, but he examined only about 50 or 60. He should say they were fairly up to sample, but one of them produced he would not pass. He added that before the war fire insurance companies might have passed boxes made of soft wood; they might also have done so during part of the war, but after 1920, owing to the attitude of fire insurance companies, he was unable to sell fuse boxes unless they were made of very hard wood.

His Honour said the whole subject in dispute was more fit for the determination of an expert.

Mr. King said they originally proposed that the matter should be referred to arbitration.

Mr. Hartley said defendant had a number of fuse boxes sent back to him by customers, but they would be made the subject of an after claim.

His Honour: They might become a question of law after the settlement of the present claim.

It was then agreed to appoint an expert referee to inquire into the material from which the boxes were made, the quality of workmanship, &c., and report to the Court.

Weston Electric Lamp Co. *v.* Stuart.

In the Shoreditch County Court on Monday, before Judge Cluer, plaintiffs, Sun Street, Finsbury Square, E.C., sued defendant, of Ramsgate, a dealer in lamps, &c., to recover £20 11s. 1d. for goods sold and delivered. The defendant admitted £5 8s. only. Mr. A. E. Robinson appeared for the plaintiffs, and said the amount was £63 13s., and credit had been given to the defendant for commission on sales to the amount of £43 1s. 11d., leaving the balance claimed. Mr. Robinson went on to say that they claimed that the defendant was not entitled to commission on returned or unpaid-for goods, and that was the dispute. Judge Cluer pointed out to the defendant that if there was a dispute he should have put in a counterclaim, but if the plaintiffs were willing to go on he would proceed with the case. Mr. Robinson agreed. Mr. Harry Fenniman, sales manager to the plaintiffs, said there was no dispute that goods had been supplied, but defendant wanted more commission than he was entitled to; they only paid on cash received. They had deducted £15 2s. 11d. for commission on returned goods and bad debts, but he seemed to think he had been treated hardly. The defendant said he never knew how he stood with the plaintiffs, as he was constantly asking for the monthly statement, which was in his agreement, but never got it. He then asked the witness: "Did you not say you were manufacturers of these electric lamps?" Witness: Certainly not; we are not manufacturers. Defendant: The whole trouble was that they would send lamps from five or six manufacturers in one consignment, some of them inferior, and of course they were rejected. Plaintiffs' witness strongly denied that this had ever occurred. Judge Cluer told the defendant that it hardly concerned the case as to whether the lamps were inferior or not. They might have been made by workmen who purposely spoilt their work, in which case they could of course be rejected. In such circumstances, of course, they would not be accepted by the buyer, and the defendant could not expect to draw any commission. There would have to be a verdict for the plaintiffs for £20 11s. 1d., and costs.

Compensation Award.

In the Mayor's and City of London Court on Monday, Charles Harding, labourer, 4, Petersfield Road, Acton, claimed compensation against the British Thomson-Houston Co., Ltd., electrical engineers and manufacturers, 83, Cannon Street, E.C., for injuries which befell him on February 16th at Acton. He was assisting to move machinery by placing rollers underneath, when one of the rollers slipped and the machinery fell on to his right hand. He had a crushed little finger of the right hand. Mr. Dale, counsel for the defendants, said they had agreed to pay £15 compensation and 5 guineas costs, which plaintiff would accept. Judge Jackson concurred.

The Shackleton-Rowett Antarctic Expedition.—We learn from the "Ceag" Miners' Supply Co., Ltd., of Barnsley, that Sir Ernest Shackleton's ship, the *Quest*, carries on board a complete equipment of standard "Ceag" miners' lamps, Cap lamps and Bull's-Eye lamps and all accessories, also a charging stand of their bulk-head type specially adapted for ship use.

NEW PATENTS APPLIED FOR, 1921.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sexton-Jones, O'Dell and Stephens, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

24,759. "Insulator blocks of high-tension electric switchgear, &c." N. P. Bedson. September 19th.

24,761. "Electric lead terminals and manufacture of same." W. Horton and W. Preston. September 19th.

24,764. "Electro-magnetic wave-transmitting systems." M. Latour. September 19th. (France, August 21st, 1915.)

24,765. "Electro-magnetic wave-transmitting systems." M. Latour. September 19th. (France, November 20th, 1915.)

24,769. "Electric vehicles." J. R. Churchill. September 19th.

24,774. "Magnetos." W. T. Farquharson. September 19th.

24,780. "Trolley heads for tramcars." M. A. Klauck. September 19th.

24,782. "Sockets or bases for trolley poles for electrically-propelled vehicles." E. M. Munro. September 19th.

24,783. "Electric alarm system for detecting a damaged seat." F. H. Page. September 19th.

24,808. "Electric motors." British Thomson-Houston Co., Ltd. (General Electric Co.). September 19th.

24,812. "Electric transformers." Allmanna Svenska Elektriska Aktiebolaget. September 19th. (Sweden, July 2nd.)

24,823. "Electric lamps." A. Kuefl. September 19th.

24,825. "Telautography." H. G. Bartholomew. September 19th.

24,847. "Telephone systems." Automatic Telephone Manufacturing Co. September 19th. (United States, October 1st, 1920.)

24,848. "Telephone systems." Automatic Telephone Manufacturing Co. September 19th. (United States, September 22nd, 1920.)

24,856. "Electric lighting from magnetos, &c." H. F. Loveland. September 19th.

24,865. "Coupling for electric cables, &c." H. E. Hadwen and H. Willis. September 20th.

24,892. "Electric heaters." P. W. Davis and F. H. Reeves. September 20th.

24,893. "Electric signalling system." W. Pack, Sunderland Forge & Engineering Co., Ltd., and H. D. Wight. September 20th.

24,911. Electrically testing and comparing strength of magnets." A. Whittingham. September 20th.

24,925. "Electric discharge apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). September 20th.

24,926. "Magneto-electric machines." British Thomson-Houston Co., Ltd., and A. P. Young. September 20th.

24,930. "Automatic safety device for electric connections." J. Hoffmann. September 20th.

24,968. "Bodies of trackless tramway cars, &c." G. A. Bishop and R. A. Chadwick. September 21st.

24,984. "Electric resistance board or panel for tandem lamp circuits." B. B. Gascoyne. September 21st.

24,990. "Signalling apparatus for mines." A. Paton. September 21st.

25,014. "Mounting electric conductors in casings." F. Krupp Akt.-Ges. September 21st. (Germany, February 10th.)

25,027. "Electric tensioning devices." British Thomson-Houston Co., Ltd. (General Electric Co.). September 21st.

25,029. "Couplings for sparking plug, &c., terminals." J. I. D. Stevenson and K. D. Stevenson. September 21st.

25,031. "Electric joints." C. J. Beaver and E. A. Claremont. September 21st.

25,041. "Electric relay devices." G. A. Cheetham, Metropolitan-Vickers Electrical Co., Ltd., and W. Smethurst. September 21st.

25,054. "Web controller." Union Bag & Paper Corporation. September 21st. (United States, July 22nd.)

25,055. "Electric switch." Union Bag & Paper Corporation. September 21st. (United States, July 22nd.)

25,056. "Safety switches for kinematographic projection apparatus." W. Firley and G. Weil. September 21st. (Czecho-Slovakia, September 21st, 1920.)

25,060. "Electrical connection and lighting boxes for mines, &c." E. B. Williams. September 21st.

25,061. "Receivers for wireless telegraphy." L. V. Lewitzki. September 21st. (France, September 21st, 1920.)

25,062. "Receiving devices for electric waves." F. Schneider. September 21st. (Germany, July 13th.)

25,073. "Switches." E. S. Riggs. September 21st.

25,076. "Valve for wireless apparatus." J. P. Prangnell. September 21st.

25,077. "Coil for wireless apparatus." J. P. Prangnell. September 21st.

25,082. "Obtaining air-tight joint for sealed electrical apparatus." G. F. Mansbridge. September 22nd.

25,084. "Sparking plugs." J. E. Barrows. September 22nd.

25,088. "Electric soldering iron." G. S. Batterby, Batterby & Hefford, and C. N. Hefford. September 22nd.

25,097. "Current collecting trolleys on electric tramcars, &c." B. Shores. September 22nd.

25,145. "Synchronous dynamo-electric machines." E. P. Hill and Metropolitan-Vickers Electrical Co., Ltd. September 22nd.

25,148. "Electric motor control." British Thomson-Houston Co., Ltd. (General Electric Co.). September 22nd.

25,157. "Distributors for electric ignition systems of internal-combustion engines." W. F. M. Rose. September 22nd.

25,158. "Production of oscillating currents, &c." Radio Communication Co., Ltd., and J. Scott-Taggart. September 22nd.

25,161. "Safety switches for kinematograph projection apparatus." W. Firley and G. Weil. September 22nd.

25,170. "Electric radiators." Soc. Générale Le Prométhée. September 22nd. (France, September 22nd, 1920.)

25,187. "Radio-receiving systems." R. H. Marriott. September 22nd. (United States, September 22nd, 1920.)

25,192. "Reflector searchlights." C. Zeiss (firm of). September 23rd. (Germany, September 24th, 1920.)

25,217. "Electric fuse boards or distribution boards." J. E. Gaffney and J. H. Tucker & Co. September 23rd.

25,232. "Electric welding or fusion deposition of metals." Quasi Arc Co., Ltd., and A. P. Strohmenger. September 23rd.

25,233. "Electric immersion heaters." C. Kratt. September 23rd.

25,234. "Electric water heaters." C. Kratt. September 23rd.

25,245. "Distributors or commutators for motor vehicles." G. H. Taylor. September 23rd.

25,247. "Insulator for electrodes of electrical gas purifiers." Lodge Fume Co., Ltd. (Metallbank und Metallurgische Ges.). September 23rd.

25,248. "Process for electrical gas purification." Lodge Fume Co., Ltd. (Metallbank und Metallurgische Ges.). September 23rd.

25,257. "Electric control systems." British Thomson-Houston Co., Ltd. (General Electric Co.). September 23rd.

25,276. "Miners' lamps, &c." Thor Electric Safety Lamp Co., Ltd. September 23rd.

25,279. "Junction boxes for electrical connections." A. H. Midgley. September 23rd.

25,282. "Storage battery plates." Chloride Electrical Storage Co., Ltd. (B. Ford). September 23rd.

25,284. "Electric switches." Soc. E. Spengler et H. Chenu. September 23rd. (France, September 23rd, 1920.)

25,295. "Electric transformers." British Power Railway Signal Co., Ltd., D. C. Gall, H. Tinsley, and H. Tinsley & Co. September 23rd.

25,325. "Electric condensers." T. F. Wall. September 24th.

25,327. "Electric light conduit fittings." G. T. Theobald. September 24th.

25,328. "Electric discharge devices." Radio Communication Co., Ltd., and J. Scott-Taggart. September 24th.

25,334. "Apparatus for distribution of sand on tramway, &c., rails." J. Murray. September 24th.

25,348. "Trolleys for electric vehicles. D. M. Hutchinson and J. Spowart. September 24th.

25,388. "Electric motor control." British Thomson-Houston Co., Ltd. (General Electric Co.). September 24th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1920.

6,656. "Automatic or semi-automatic telephone systems." D. C. Crowe. March 4th, 1920. (168,611.)

9,687. "Process of and apparatus for electrical welding." Wilson Welder and Metals Co., Inc. April 22nd, 1919. (142,090.)

9,693. "Adjustable standard for electric lamps." L. S. Hammarback. April 4th, 1919. (141,354.)

12,593. "Recording mechanism for use with electrical sign telegraphs." H. K. Harris. May 6th, 1920. (168,630.)

14,829. "Electrical plug socket and switch combinations." J. A. Crabtree. June 1st, 1920. (168,641.)

14,899. "Relay contacts and method of making the same." F. L. Dodgson. June 1st, 1920. (168,642.)

14,977. "Indicating or adjusting devices for wireless direction-finding coils and other devices." S. F. Woodell. June 2nd, 1920. (168,649.)

15,008. "Method of and means for electrically synchronising apparatus over a long distance." H. M. Petersen. June 2nd, 1920. (168,650.)

15,195. "Modulated signalling systems particularly applicable to wireless signalling." N. Lea and Radio Communication Co., Ltd. June 4th, 1920. (168,660.)

15,196. "Electric foot and food heater and vaporiser." L. A. Edwards. June 4th, 1920. (168,661.)

15,276. "Filaments and like bodies." British Thomson-Houston Co., Ltd. (General Electric Co.). June 5th, 1920. (168,669.)

15,587. "Means for automatically controlling the temperature of electric heating apparatus." Soc. Anon Des Etablissements L. Bleriot. February 5th, 1919. (144,669.)

16,070. "Telephone systems." Western Electric Co., Ltd. June 14th, 1915. (145,034.)

16,266. "Electric signalling systems especially applicable to telephone systems." Western Electric Co., Ltd. August 31st, 1915. (145,066.)

16,328. "Alternating current motors." R. Kimura and T. Seisakusho. June 16th, 1920. (168,695.)

16,389. "Electro-metallurgical process for manufacture of ductile bodies of high fusing metals and alloys of same." E. Aoyagi. June 17th, 1920. (168,697.)

16,435. "Vacuum rectifiers with rotating electric arc." Siemens Schuckertwerke Ges. October 23rd, 1915. (145,423.)

16,806. "Automatic electric switches for use more especially in relay circuits." Austin Motor Co., Ltd., and C. B. Walker. June 22nd, 1920. (168,706.)

16,944. "Electrical switchgear." W. A. Coates, G. E. Gettins, D. R. Davies, and Metropolitan-Vickers Electrical Co., Ltd. June 22nd, 1920. (168,707.)

17,849. "Automatically-operated electric switch mechanism for use in connection with kinematograph apparatus to cut off the current in case of breakage of a film." J. W. Cliffe and T. B. Rutter. June 30th, 1920. (168,723.)

19,334. "Production of high-power currents of constant frequency." Ges. fur Drahtlose Telegraphie. December 31st, 1915. (147,431.)

19,375. "Electro-magnetic wave signalling systems." M. Latour. November 11th, 1915. (147,462.)

19,931. "Electricity meters." Siemens Schuckertwerke Ges. March 15th, 1918. (147,879.)

19,990. "Membranous transmitters or receivers for subaqueous sound signals." Signal Ges. May 8th, 1915. (147,935.)

19,991. "Submarine sound-producing devices." Signal Ges. June 14th, 1915. (147,936.)

19,996. "Subaqueous sound producers or receivers." Signal Ges. November 27th, 1917. (147,941.)

20,002. "Receiving device for submarine sound signals with a receiving member abutting on the water and a detecting device." Signal Ges. October 26th, 1914. (147,947.)

20,231. "Arrangement for carrying wireless stations." Dr. E. F. Huth Ges. October 30th, 1913. (148,317.)

20,279. "Electric heating apparatus." L. de Soissan. December 13th, 1913. (148,359.)

20,824. "Electrical contact device." Ges. fur Nautische Instrumente. May 11th, 1916. (148,964.)

20,952. "Inclined carbon lamp provided with magnetic regulations of the arc." R. Mylo. January 28th, 1918. (149,205.)

21,004. "Contacts for electric switches and other circuit-closing devices." A. West & Co., Ltd., and G. Page. July 12th, 1920. (168,741.)

23,176. "Apparatus for starting single armature converters from the alternating current side." Akt.-Ges. Brown, Boveri et Cie. August 16th, 1919. (149,930.)

25,249. "Safety controlling apparatus for electrically-driven vehicles." C. C. Farmer. March 26th, 1920. (160,742.)

26,654. "Repeaters for high-frequency electric signalling systems." Western Electric Co., Ltd. September 30th, 1919. (151,926.)

26,899. "Electro-magnetically operated sounding horns and the like." E. Magerle. April 10th, 1920. (161,548.)

30,987. "Controllers for electric motors." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). November 2nd, 1920. (168,804.)

34,265. "Electrical treatment of ferrous metals during casting." J. H. Wickett. June 3rd, 1920. (Divided application on 154,711.) (168,812.)

1921.

8,832. "Electric relays especially suitable for wireless telegraphy." P. Buchenot. March 24th, 1920. (160,730.)

16,624. "Electrical controllers." Metropolitan-Vickers Electrical Co., Ltd. July 15th, 1920. (166,518.)

New Capital in Germany.—In the first quarter of 1921 the creation of fresh capital in Germany amounted to 11,598,000,000 marks. Of this total, the electrical industry figured for 375,000,000 marks in shares and bonds, while the capital of new companies totalled 380,000,000 marks.